U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF CHEMISTRY.

BULLETIN No. 30.

EXPERIMENTS

WITH

SUGAR BEETS

IN

1890.

BY

HARVEY W. WILEY,

Chemist of the U. S. Department of Agriculture and Director of the Department Sugar Experiment Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida; and Sterling and Medicine Lodge, Kansas.

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.

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PREFATORY NOTE.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., March 28, 1891.

SIR: I submit for your inspection and approval the manuscript of Bulletin No. 30 of the Chemical Division, containing a record of the experiments made by the Department in 1890 with sugar beets.

The work of the Department recorded in this bulletin consists chiefly of analyses of samples of beets grown in many different States. In addition to this work, a few culture experiments, on a small scale, were carried on under the supervision of the Department. A chemist from this Division was also stationed at the Grand Island Sugar Factory, in Nebraska, and data of the greatest value were secured at that place.

Special studies of the whole subject of the growth of the sugar beet and the manufacture of sugar therefrom were published in Bulletin No. 27. In Farmers' Bulletin No. 3 have been published full instructions for the culture of the sugar beet. The data contained in these two bulletins are supplemented by the facts recorded in the present one, which show further that beets of fine quality and well suited for manufacturing purposes can be grown in the United States.

So conclusive have been the results obtained as to fully justify the action of the Department in establishing a culture station at Schuyler, Nebraska, for the more exact study of the conditions of the most successful methods of growing sugar beets in this country.

Respectfully,

H. W. WILEY,
Chemist.

HON. J. M. RUSK,
Secretary of Agriculture.

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EXPERIMENTS WITH SUGAR BEETS IN 1890.

PURCHASE AND DISTRIBUTION OF SEEDS.

From Mr. Henry T. Oxnard, the Department purchased 3 tons of sugar-beet seed, of which the greater portion was the variety known as the Klein Wanzlebener, grown by Dippe Brothers, of Quedlinburg. In addition to this, however, smaller quantities of the White Improved Vilmorin were purchased, together with the varieties of beets grown by Lemaire, Simon Legrand, Florimond, and Bulteau Desprez. These different varieties were put in one-pound packages and sent to over one thousand different persons who had made special inquiry for them. Accompanying these packages were directions for preparing the soil and planting and cultivating the beets. Directions were also sent for harvesting and sampling the beets and for sending samples to the Department for analysis. Nearly one thousand samples of beets were received by the Department, of which the analyses were made and the results communicated to the farmers sending them. In addition to this work a large number of the beet plots were personally inspected by agents of the Department, and particular inquiry was directed to a large number of farmers in regard to the methods of cultivation which they had pursued.

Only in a few instances were the directions of the Department followed out to the letter. In most cases the planting and cultivation of the beet seed were conducted according to such methods as the agriculturist might hit upon at the time. From the information gathered it was found that the chief variation from the instructions was in the preparation of the soil. In very few cases was a subsoil plow used and most of the beets which were sent to the Department were evidently grown in soil of insufficient depth. In some cases, where the exact directions for cultivation were carried out, the character of the beets received showed by contrast with the others the absolute necessity of employing the best methods of agriculture for their production.

It was not thought best the first year to make any effort to obtain from the farmers the exact yield of their beets per acre. The difficulty of securing such information is almost insurmountable. In the first place the amount of land under cultivation is usually guessed at, and in very few cases are exact measurements made. The results, therefore,

at best are only estimates unless the absolute control of measurements and weights can be secured. It was thought best, therefore, to depend for estimates of yield upon the actual quality of the beets produced, since it is well known that about 40,000 beets of fair quality can be produced upon an acre. It is therefore fair to presume that the yield per acre would be, within ordinary limits, the weight of the average beet sent for analysis multiplied by 40,000. When, however, it is necessary to speak of the beets weighing over one pound the rule no longer holds good, as it would be evidently impracticable to grow 40,000 beets of such a size upon an acre. It is fair, however, to estimate the yield upon beets weighing about 1 pound at 40,000 per acre or 20 tons. It is not meant by this that a yield of 20 tons can be obtained by farmers at the beginning, for this is not the case; it is only exceptionally that such a yield can be secured. When, however, the exact methods of beet culture are thoroughly understood and the method of fertilizing and preparing the soil studied, it will not be difficult, with favorable climatic conditions, to secure a yield of beets equal to 20 tons per acre.

EXPERIMENTS AT FACTORIES.

By the courtesy of the managers of the company the Department was permitted to station a chemist at Grand Island, who had charge of the sampling of the beets as they came to the factory in wagons or carloads. Nearly three thousand analyses of samples were made and the full tabulated reports of these analyses will be found following. The proprietors of the factory were so encouraged by the season's work that they have decided to erect another large factory at Norfolk, Nebraska, and at the Chino Ranch in southern California, and work on these factories is now going on.

Manufacturing experiments, on a small scale, with sugar beets, were also carried on during the season just past at Medicine Lodge, Kansas. About 80 acres of beets in all were harvested for the factory, and a summary of the work done will be given in another place.

FINANCIAL RETURNS TO BEET-GROWERS.

In general, the following remarks may be made concerning the last season's work in the beet-sugar industry, from a commercial point of view, in Nebraska and Kansas.

The summer in both localities was exceptionally dry. For this reason and on account of lack of knowledge among the farmers in regard to the proper methods of raising beets the average crop was very short. In Nebraska the exact tonnage can not be known, but probably it would not average more than 2 or 3 tons of beets per acre; in Kansas the average seems to have been somewhat higher. In many cases farmers obtained 10 and even 15 tons of beets per acre, showing that even in adverse conditions of season a reasonably large crop may be harvested when all other conditions necessary to the proper growth of the crop are attended to.

As might well be expected from the small yield, the farmers in general were dissatisfied with the season's work. It is not reasonable to expect satisfaction from a crop of so low an average when the labor of growing it is so great; but while the farmers are dissatisfied it must be confessed that a great deal of this dissatisfaction must be attributed to their own lack of knowledge of the subject or to their disinclination to put upon the beet fields the proper amount of labor and culture at the proper time. Instead of being therefore deterred from continuing the production of sugar beets, it would seem wiser on the part of the farmers to study carefully the methods of agriculture pursued by those who made a success of beet culture, and to imitate those methods during the coming season. The fact should not be forgotten, however, that even with the poor results obtained the beet crop was uniformly better than the average of other crops in the same locality.

It would be useless to hold out to the farmer the hope of financial reward from a beet crop which would average only 3 tons per acre; but if from this acre he could produce 10 to 15 tons of beets then his venture would prove financially successful. In order that the manufacture of beet sugar should become an established commercial success, the factories and the farmers must work in harmony. The method pursued in France and in Germany would probably be best suited to bring about this result. In those countries the beet growers themselves are usually shareholders in the factories, and thus participate in the profits. It is probable that the annual dividends of German and French beet-sugar factories do not fall below 10 per cent net on the capital invested. The farmer, therefore, who has even a small interest in such a factory secures a handsome profit on his invested capital. At the same time he has a vote in the board of directors and is personally interested in the success of the factory. In many factories of Europe the stock is thus held by the beet-growers. If, on the other hand, the whole of the factory be owned by the capitalists, then there is a cause for continual conflict between the interests of the farmer and the interests of the manufacturer, although this conflict is perhaps more in theory than practice. Even if the factory be owned exclusively by the capitalists, it is to their interest to work in harmony with the farmers, in order that they may secure a crop of sufficient magnitude to render the operation of their factory profitable.

It perhaps, however, would be unavoidable at the beginning of the industry that a feeling of animosity should exist between the beet-grower and the manufacturer. After a few years the prices to be paid for beets and other agreements with the farmers will doubtless be adjusted on a scale of equity and satisfacton to all concerned. In case farmers have no money to put into beet-sugar factories they might take shares of stock and pay for them with beets during the first and second years; in this way they would secure a financial interest in the company, own their shares of stock, and pay for them from the proceeds of the field without investing in ready cash. By adopting some such plan

as this it might be possible to get every beet-grower within reach of the factory to become himself interested as a stockholder.

ANALYTICAL DATA RELATING TO BEETS GROWN FROM SEED PURCHASED BY THE DEPARTMENT.

The samples of beets which were sent to the Department in response to the request already noted were immediately analyzed and the results of the analyses communicated to the growers of the beets. Returns were received from a great many States, but principally from Nebraska and Minnesota.

The data obtained follow arranged alphabetically by States and counties:

CALIFORNIA.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Los Angeles County.				P. ct.	P. ct.			P. ct.	Gr'ms.
University of California.	7616	Excelsior	Sept. 27	16.3	15.5	84.5	18.1	.90	407
Do	7617	Imperial	Sept. 27	14.9	14.2	80.5	15.1	.99	372
Do	7618	Imperial Improved	Sept. 27	13.9	13.2	82.2	12.4	1.12	397
Do	7619	Vilmorin	Sept. 27	16.8	16.0	87.0	17.9	.94	352
Average				15.5	14.7	84.6	15.9	.99	382

COLORADO.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Garfield County.									
A. J. Saint	7956	Klein Wanzlebener	Oct. 23	13.7	13.0	74.1	9.9	1.39	405
Larimer County.									
C. S. Crandal	8035	Bulteau Desprez	Oct. 27	16.0	15.2	86.0	16.9	.95	395
Do	8036	do	Oct. 27	15.5	14.7	84.7	16.3	.95	460
Do	8037	Vilmorin	Oct. 27	13.6	12.9	76.8	13.7	.99	1,320
Do	8038	Klein Wanzlebener	Oct. 27	15.9	15.1	86.0	16.7	.95	805
Do	8039	Florimond Desprez	Oct. 27	16.2	15.4	84.4	18.0	.90	475
Do	8040	Simon Legrand	Oct. 27	12.1	11.5	80.2	12.9	.94	665
Wm. Boyce	8096	Lane's Imperial	Nov. 1	13.4	12.7	84.3	14.1	.95	390
Average				14.7	14.0	83.2	15.5	.95	644
Mesa County.									
H. R. Rhone	8073		Oct. 30	15.2	14.4	86.4	13.0	1.17	453
Phillips County.									
C. R. Peters	7766	Florimond Desprez	Oct. 10	12.6	12.0	69.9	8.5	1.49	533
Do	7767	Klein Wanzlebener	Oct. 10	14.6	13.8	74.9	10.5	1.39	755
Mrs. M. Peters	7785	Florimond Desprez	Oct. 10	13.7	13.0	71.0	7.1	1.99	620
Average				13.6	12.9	71.9	8.7	1.62	638
Prowers County.									
A. R. Black	7789	Colorado Imperial	Oct. 11	9.6	9.1	66.2	5.8	1.67	533
Do	7793	California Legrand	Oct. 11	9.2	8.7	67.6	5.7	1.61	606
Do	7794	Florimond Desprez	Oct. 11	11.6	11.0	71.6	10.7	1.08	590
Do	7795	Colorado Vilmorin	Oct. 11	8.4	8.0	64.1	5.0	1.69	463
Do	7796	Klein Wanzlebener	Oct. 11	12.7	12.1	74.7	8.4	1.52	403
Average				10.3	9.8	68.8	7.1	1.51	519

COLORADO—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Pueblo County.									
				P. ct.	*P. ct.*			*P. ct.*	*Gr'ms.*
Pueblo Board of Trade	8177		Nov. 8	11.4	10.8	76.5	8.8	1.30	515
Do	8178		Nov. 8	15.5	14.7	82.9	13.3	1.17	630
Do	8179		Nov. 8	15.9	15.1	84.1	14.0	1.12	580
Do	8180		Nov. 8	15.4	14.6	83.7	14.3	1.08	485
Do	8181		Nov. 8	12.3	11.7	77.9	7.8	1.57	545
Do	8182		Nov. 8	10.6	10.1	70.2	10.3	1.03	690
Average				13.5	12.8	79.2	11.4	1.21	578
San Miguel County.									
C. F. Truax	8264	Vilmorin	Nov. 17	9.5	9.0	65.5	7.5	1.26	875
Do	8265		Nov. 17	11.3	10.7	66.1	7.4	1.53	765
Average				10.4	9.9	65.8	7.5	1.40	820
Yuma County.									
H. Hitchcock	7871	Klein Wanzlebener	Oct. 15	12.6	12.1	75.9	10.4	1.21	720
Do	7872		Oct. 15	8.2	7.8	63.1	6.8	1.21	425
Average				10.4	9.9	69.5	8.6	1.21	573
County unknown.									
C. W. Zepp	8055	Simon Legrand	Oct. 29	15.7	14.9	79.7	12.1	1.30	333
Do	8113	Klein Wanzlebener	Nov. 3	19.2	18.2		13.3	1.44	93
Average				17.4	16.5	79.7	12.7	1.37	213

CONNECTICUT.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Litchfield County.									
W. H. Barber	7939	German Imperial	Oct. 21	10.8	10.3	76.1	7.1	1.53	410
Do	7940		Oct. 21	9.6	9.1	76.2	7.6	1.26	390
Average				10.2	9.7	76.1	7.4	1.40	400

IDAHO.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Ada County.									
N. F. Kimball	7970		Oct. 24	8.4	8.0	68.3	9.0	1.21	100

ILLINOIS.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Kendall County.									
Peter Solomon	8029		Oct. 27	7.2	6.5	64.9	7.0	1.03	832
Pike County.									
Fred Epker	8170		Nov. 7	10.7	10.2	71.8	7.9	1.35	1,368
Platt County.									
G. H. Morse	8410		Nov. 22	6.4	6.1	61.0	4.3	1.48	685
Will County.									
J. W. Merrill	7787	White Sugar	Oct. 10	10.8	10.3	67.6	10.0	1.08	645
Henry Abbott	8108	do	Nov. 3	7.9	7.7	65.3	7.8	0.99	775
E. McAllister	8266	French Richest	Nov. 17	15.9	15.1	85.0	16.1	0.99	600
Do	8267	do	Nov. 17	14.7	14.0	83.7	14.3	1.03	1,445
S. Mottinger	8299	German Imported	Nov. 20	13.3	12.6	77.3	11.4	1.17	686
Average				12.5	11.9	75.8	11.9	1.05	830

INDIANA.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Benton County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
Thos. Schluttenhafer.	7373	Vilmorin	Sept. 22	12.6	12.0	79.2	16.4	.77	252
Do	7374	Klein Wanzlebener	Sept. 22	11.0	10.4	73.3	12.9	.85	322
H. W. Wiley	7607	do	Sept. 26	12.5	11.9	81.7	15.4	.81	417
Do	7776		Oct. 10	12.1	11.5	78.0	13.3	.91	500
Do	7777		Oct. 10	9.8	9.3	69.0	11.9	.82	470
Do	7925		Oct. 20	13.9	13.2	88.5	12.4	1.25	535
Do	7912		Oct. 22	13.9	13.2	84.8	14.6	.95	413
Do	8017		Oct. 27	13.4	12.7	95.0	16.5	.81	690
Do	8422		Nov. 25	14.6	13.9	81.1	16.2	.90	687
Joseph Gnetter	7778		Oct. 10	11.6	11.0	75.8	10.5	1.11	1115
Ole Olson	7945	Green Top	Oct. 22	8.5	8.1	66.9	6.3	1.35	1250
J. G. Bozemore	8072	White Sugar	Oct. 30	12.6	12.0	79.7	10.4	1.21	1320
John Patterson	8074		Oct. 30	12.2	11.6	73.5	12.3	.99	517
John Kaar	8079		Oct. 31	14.2	13.5	85.6	17.5	.81	900
J. H. Schott	8081		Oct. 31	13.8	13.1	85.7	16.7	.81	515
N. B. Nutt	8136		Nov. 5	15.0	14.2	87.7	15.8	.95	823
Oliver Nutt	8137		Nov. 5	13.5	12.8	84.4	18.8	.77	733
G. S. Kaar	8080		Oct. 31	13.2	12.5	84.1	15.3	.86	665
Joseph Gnetter	7779		Oct. 10	12.2	11.6	80.8	12.8	.95	1115
Average				12.6	12.0	80.8	14.0	0.94	697
Cass County.									
Henry Bloom	7670	Klein Wanzlebener	Oct. 4	14.6	13.9	88.0	22.1	.66	680
Do	7671	Florimond Desprez	Oct. 4	10.3	9.8	77.4	13.9	.74	810
G. W. Conrad	7952		Oct. 22	10.4	9.9	73.8	7.2	1.44	1100
M. L. Spice	8274		Nov. 17	14.8	14.1	66.4	8.6	1.71	410
Westly Stauffer	8275		Nov. 17	15.1	14.3	63.8	8.8	1.71	300
Jas. Bell	8276		Nov. 17	13.3	12.6	61.9	6.4	2.07	450
Average				13.1	12.4	71.9	11.2	1.39	625
Clinton County.									
John Betts	8273		Nov. 17	19.1	18.1	78.9	14.7	1.30	430
Decatur County.									
G. W. Snyder	7362	Klein Wanzlebener	Sept. 18	5.6	5.3	58.9	4.8	1.17	1840
Grant County.									
H. D. Thomas	7734	Klein Wanzlebener	Oct. 8	9.8	9.3	73.7	9.9	.99	675
Do	7735	Imperial	Oct. 8	9.3	8.8	70.8	7.3	1.28	583
Do	7736	Florimond Desprez	Oct. 8	8.3	7.9	68.0	6.5	1.27	665
Snead Thomas	8449		Dec. 5	9.6	9.1	72.2	9.3	1.03	695
Do	8450	Imperial	Dec. 5	8.2	7.8	66.7	6.1	1.35	885
Average				9.0	8.6	70.3	7.8	1.18	701
Green County.									
L. D. Maddux	8152	Klein Wanzlebener	Nov. 6	15.4	14.6	......	12.7	1.21	220
Do	8153	Lemaire's Improved	Nov. 6	12.7	12.1	77.9	10.9	1.17	385
Average				14.1	13.4	77.9	11.8	1.19	303
Hamilton County.									
A. Smith	8283		Nov. 19	10.3	9.8	72.5	7.6	1.35	605
Ira W. Christian	8421		Nov. 24	11.1	10.5	66.9	6.3	1.75	407
Average				10.7	10.2	69.7	7.0	1.55	506
Hancock County.									
S. Caroway	7371	Legrand White Impr.	Sept. 22	11.1	10.5	75.4	12.3	0.90	445
Do	7372	Klein Wanzlebener	Sept. 22	3.5	3.3	28.2	3.2	1.08	990
Average				7.3	6.9	51.8	7.8	0.99	718
Henry County.									
P. Hayse	8123		Nov. 3	11.2	10.6	82.6	11.2	1.00	780

INDIANA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Howard County.									
				P. ct.	*P. ct.*			*P. ct.*	*Gr'ms.*
Dr. T. Baldwin	8277		Nov. 17	13.9	13.2	70.5	8.8	1.57	600
Marion County.									
J. H. Bradford	7782	Florimond Desprez	Oct. 10	6.4	6.1	60.3	4.4	1.44	940
Do	7783	Klein Wanzlebener	Oct. 10	9.8	9.3	72.1	9.0	1.09	935
J. V. Carter	7933	Lemaire	Oct. 20	8.1	7.7	64.3	6.4	1.26	565
Do	7934	Klein Wanzlebener	Oct. 20	8.2	7.8	......	5.5	1.48	430
Dr. J. P. Cope	7950	do	Oct. 22	16.2	15.4	......	8.3	1.98	115
Do	7951	Florimond Desprez	Oct. 22	13.5	12.8	......	9.1	1.48	300
Average				10.4	9.8	65.6	7.1	1.46	548
Montgomery County.									
P. S. Kennedy	7740		Oct. 8	7.9	7.5	63.2	7.4	1.07	855
Do	7741		Oct. 8	8.3	7.9	65.6	7.8	1.06	1,050
Average				8.1	7.7	64.4	7.6	1.07	953
Newton County.									
J. E. Watt	7946	White	Oct. 22	10.6	10.1	72.1	8.4	1.26	475
Do.	7947	White Rose Heart	Oct. 22	10.4	9.9	71.2	8.3	1.26	610
Average				10.5	10.0	71.7	8.4	1.26	543
Pike County.									
J. T. Brumfield	7370	Klein Wanzlebener	Sept. 22	11.2	10.5	75.7	11.8	0.95	432
Tippecanoe County.									
W. A. Conklin	7919	Lemaire	Oct. 20	8.2	7.8	61.2	6.1	1.35	605
Do	7920	Klein Wanzlebener	Oct. 20	9.3	8.8	67.9	8.6	1.08	600
Average				8.8	8.3	64.6	7.4	1.21	603
White County.									
Wm. Love	7747	White Improved	Oct. 9	7.8	7.4	63.4	6.0	1.31	630
Do	7748	Klein Wanzlebener	Oct. 9	9.4	8.9	65.3	10.0	0.99	250
Z. C. Love	7755	White Improved	Oct. 9	8.8	8.4	61.1	6.4	1.38	750
Average				8.7	8.2	63.3	7.5	1.23	543

IOWA.

Audubon County.									
Mrs. S. Simpson	7909		Oct. 18	11.3	10.7	74.9	8.7	1.30	535
Black Hawk County.									
Bozarth Bros	7770		Oct. 10	12.9	12.3	83.2	13.0	.99	510
Do	7771		Oct. 10	10.8	10.3	74.5	9.6	1.12	740
Do	7772	Klein Wanzlebener	Oct. 10	14.5	13.8	80.1	19.3	.75	550
Do	7773	do	Oct. 10	12.9	12.3	78.6	14.3	.90	605
J. A. Fellers	7774	do	Oct. 10	13.6	12.9	71.5	14.5	.94	440
Do	7775	do	Oct. 10	15.9	15.1	81.5	18.1	.88	625
Average				13.4	12.8	78.2	14.5	.93	578
Carrol County.									
G. Wattles	7898		Oct. 17	14.6	13.9	81.6	15.5	.94	810
Do	7899		Oct. 17	10.9	10.4	67.3	8.1	1.34	985
Henry Silvers	8020	Vilmorin	Oct. 27	12.4	11.8	74.7	10.2	1.21	640
August Bohme	8021	do	Oct. 27	15.5	14.7	85.2	14.4	1.08	213
Daniel Cooper	8078	do	Oct. 30	12.7	12.1	73.4	10.1	1.26	265
Average				13.2	12.6	76.4	11.7	1.17	583

IOWA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Cherokee County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
F. M. Langley	7692	Klein Wanzlebener	Oct. 6	9.7	9.2	63.4	6.4	1.52	440
Do	7693	do	Oct. 6	12.1	11.5	72.9	9.9	1.22	507
Average				10.9	10.4	68.2	8.2	1.57	474
Fayette County.									
J. W. Yeaden	7602	Klein Wanzlebener	Sept. 25	10.4	9.9	71.7	9.3	1.12	752
G. W. Kiple	7605	do	Sept. 25	13.3	12.6	79.6	12.9	1.03	747
Average				11.9	11.3	75.7	11.1	1.08	750
Harrison County.									
R. Yeisley & Son	7642		Sept. 30	13.9	13.2	79.4	11.4	1.22	1,002
Do	7737		Oct. 8	8.8	8.4	66.7	5.6	1.57	1,027
Average				11.4	10.8	73.1	8.5	1.40	1,013
Page County.									
J. A. Johnson	7954	Brabant	Oct. 23	11.7	11.1	72.6	11.8	.99	668
Polk County.									
H. Wendt	8270	Florimond Desprez	Nov. 17	6.1	5.8	56.0	3.7	1.66	430
Do	8271	Klein Wanzlebener	Nov. 17	10.7	10.2	......	7.7	1.39	280
Average				8.4	8.0	56.0	5.7	1.53	355
Sioux County.									
N. G. O. Coad	7703		Oct. 6	12.4	11.8	71.7	8.1	1.50	298
Do	7704		Oct. 6	10.7	10.2	69.0	7.3	1.47	1,045
John Cornforth	8016		Oct. 27	13.6	12.9	77.3	10.1	1.35	1,020
Average				12.2	11.6	72.7	8.5	1.44	788
Webster County.									
R. Hoff	7892	Vilmorin	Oct. 16	15.9	15.1	95.2	18.3	.81	320
Do	8172	do	Nov. 8	18.1	17.2	87.5	23.5	.77	220
Do	8173	do	Nov. 8	17.6	16.7	91.1	25.9	.68	520
Do	8174	do	Nov. 8	8.7	8.3	65.4	6.4	1.35	1,180
Average				15.1	14.4	84.8	18.5	.90	560
Woodbury County.									
Mrs. H. A. Mercer	7638	Klein Wanzlebener	Sept. 29	10.0	9.5	68.5	7.7	1.30	665
Do	7639	Vilmorin	Sept. 29	10.4	9.9	65.4	6.8	1.53	590
Average				10.2	9.7	67.0	7.3	1.42	628

KANSAS.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Barber County.									
W. H. Fleming	8432		Dec. 1	14.6	13.9	81.1	11.2	1.03	259
O. Coyle	8433		Dec. 1	17.8	16.9	84.8	17.3	1.03	140
Allan W. Smith	8434		Dec. 1	14.1	13.4	74.2	11.7	1.21	690
Average				15.5	14.7	80.0	14.4	1.09	363
Bourbon County.									
Wm. Lehman	8106	German beet	Nov. 3	6.5	6.2	61.3	4.5	1.44	1,645
Do	8107	American beet	Nov. 3	9.5	9.0	72.0	7.9	1.21	1,925
J. C. Hart	8160	White Vilmorin	Nov. 7	13.5	12.8	86.6	13.6	.99	640
Average				9.8	9.3	73.3	8.7	1.21	1,403

KANSAS—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Butler County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
L. R. Smith	7879	Florimond Desprez	Oct. 15	10.2	9.7	70.5	8.4	1.21	685
Lyon County.									
Sen. P. B. Plumb	7385		Sept. 24	4.9	4.7	50.0	3.3	1.50	2,130
Do	7386		Sept. 24	4.2	4.0	51.2	3.1	1.35	2,695
Average				4.6	4.4	50.6	3.2	1.43	2,423
Clay County.									
Mrs. C. W. Blacklund	7722	Klein Wanzlebener	Oct. 6	10.9	10.4	......	7.1	1.53	162
Do	7723	Florimond Desprez	Oct. 6	9.5	9.0	70.3	6.5	1.46	232
E. B. Marian	7760	...do	Oct. 10	8.5	8.1	64.8	6.3	1.36	1,010
Do	7761	Simon Legrand	Oct. 10	10.4	9.9	68.0	7.2	1.44	1,040
Average				9.8	9.3	67.6	6.8	1.45	611
Douglas County.									
S. D. Coffin	8423	Klein Wanzlebener	Nov. 25	8.5	8.1	65.3	5.2	1.62	1,385
Do	8424	...do	Nov. 25	9.2	8.7	64.8	5.3	1.75	965
Average				8.9	8.4	65.1	5.3	1.68	1,175
Hamilton County.									
A. L. Bandy	8041	Klein Wanzlebener	Oct. 28	15.7	14.9	82.2	13.8	1.12	720
Do	8042	Florimond Desprez	Oct. 28	10.9	10.4	71.3	7.8	1.39	780
Average				13.3	12.6	76.8	10.8	1.26	750
Johnson County.									
Geo. B. Lord	7810	Klein Wanzlebener	Oct. 13	9.3	8.8	68.4	7.1	1.31	410
Do	7811	Vilmorin	Oct. 13	16.8	16.0	......	12.2	1.38	180
Average				13.05	12.4	68.4	9.7	1.35	295
Saline County.									
Ed. Latz	7666	Klein Wanzlebener	Oct. 3	8.4	8.0	65.6	8.6	1.28	930
Do	7667	Florimond Desprez	Oct. 3	8.2	7.8	60.7	8.1	1.01	847
Average				8.3	7.9	63.2	8.4	1.15	889
Stafford County.									
S. A. Marteeny	7815	Klein Wanzlebener	Oct. 13	12.1	11.5	75.2	10.0	1.20	548

MARYLAND.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Prince George's County.									
Maryland Agricultural Experiment Station.	7882	Vilmorin	Oct. 16	12.3	11.7	82.0	15.2	.81	435
Do	7883	Simon Legrand White Improved.	Oct. 16	14.2	13.5	88.2	16.5	.86	480
Do	7884	Bulteau Desprez Richest.	Oct. 16	8.6	8.2	72.3	7.7	1.12	413
Do	7885	Florimond Desprez Richest.	Oct. 16	8.3	7.9	74.1	8.7	.95	433
Do	7886	Klein Wanzlebener	Oct. 16	10.8	10.3	81.8	10.9	.99	445
Do	7984	Vilmorin	Oct. 25	10.4	9.9	77.0	9.6	1.08	265
Do	7985	Simon Legrand White Improved.	Oct. 25	7.9	7.5	70.2	7.3	1.08	355
Do	7986	Bulteau Desprez Richest.	Oct. 25	10.2	9.7	75.6	9.6	1.08	335
Do	7987	Florimond	Oct. 25	11.1	10.6	82.2	12.9	.86	425

MARYLAND—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Prince George's County—Continued.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
Maryland Agricultural Experiment Station.	7988	Klein Wanzlebener	Oct. 25	9.3	8.8	73.8	9.4	.99	540
Do	8057	Dippe's Vilmorin	Oct. 29	15.9	15.1	90.4	19.6	.81	383
Do	8058	Simon Legrand White Improved.	Oct. 29	13.2	12.5	82.5	11.5	1.17	300
Do	8059	Bulteau Desprez Richest.	Oct. 29	8.6	8.2	73.5	8.0	1.08	580
Do	8060	Florimond Desprez Richest.	Oct. 29	10.0	9.5	76.9	8.9	1.12	320
Do	8061	Klein Wanzlebener	Oct. 29	11.1	10.6	78.2	10.5	.99	380
Do	8097	Dippe's Vilmorin	Nov. 1	10.5	10.0	69.0	6.9	1.53	330
Do	8098	Simon Legrand White Improved.	Nov. 1	12.5	11.9	86.8	12.1	1.03	320
Do	8099	Bulteau Desprez Richest.	Nov. 1	10.5	10.0	77.8	9.7	1.08	435
Do	8100	Florimond Desprez Richest.	Nov. 1	8.3	7.9	66.9	7.7	1.08	335
Do	8101	Klein Wanzlebener	Nov. 1	13.3	12.6	......	13.4	.99	168
Do	8140	Dippe's Vilmorin	Nov. 5	14.6	13.9	......	21.5	.68	155
Do	8141	Simon Legrand White Improved.	Nov. 5	14.5	13.8	......	24.6	.59	195
Do	8142	Bulteau Desprez Richest.	Nov. 5	12.7	12.1	......	16.5	.77	153
Do	8143	Florimond Desprez Richest.	Nov. 5	12.6	12.0	......	18.5	.68	163
Do	8144	Klein Wanzlebener	Nov. 5	13.2	12.5	......	16.3	.81	140
Do	8161	Dippe's Vilmorin	Nov. 7	13.2	12.5	84.6	18.3	.72	198
Do	8162	Simon Legrand White Improved.	Nov. 7	13.6	12.9	81.4	18.9	.72	170
Do	8163	Bulteau Desprez Richest.	Nov. 7	11.5	10.9	82.2	13.4	.86	137
Do	8164	Florimond Desprez Richest.	Nov. 7	12.5	11.9	82.3	17.4	.72	183
Do	8165	Klein Wanzlebener	Nov. 7	13.4	12.7	......	15.6	.86	120
Do	8200	Dippe's Vilmorin	Nov. 12	15.4	14.6	......	26.1	.59	170
Do	8201	Simon Legrand White Improved.	Nov. 12	14.1	13.4	......	19.6	.72	135
Do	8202	Bulteau Desprez Richest.	Nov. 12	12.6	12.0	......	15.6	.81	136
Do	8203	Florimond Desprez Richest.	Nov. 12	14.9	14.2	......	23.6	.63	103
Do	8204	Klein Wanzlebener	Nov. 12	13.3	12.6	......	18.5	.72	173
Do	8224	Vilmorin	Nov. 15	13.1	12.5	80.8	12.8	1.08	605
Do	8225	Simon Legrand White Improved.	Nov. 15	11.0	10.5	78.0	9.8	1.12	760
Do	8226	Bulteau Desprez Richest.	Nov. 15	10.4	9.4	76.5	8.6	1.21	830
Do	8227	Florimond Desprez Richest.	Nov. 15	9.8	9.3	74.8	10.3	.95	645
Do	8228	Klein Wanzlebener	Nov. 15	10.7	10.2	76.5	11.4	.94	370
Do	8229	Dippe's Vilmorin	Nov. 15	15.1	14.4	83.9	15.9	.95	385
Do	8230	Simon Legrand White Improved.	Nov. 15	14.9	14.2	83.2	16.4	.90	285
Do	8231	Bulteau Desprez Richest.	Nov. 15	13.7	13.0	82.5	14.4	.95	275
Do	8232	Florimond Desprez Richest.	Nov. 15	7.9	7.5	69.9	8.8	.90	530
Do	8233	Klein Wanzlebener	Nov. 15	12.1	11.5	78.6	10.8	1.12	255
Do	8234	Dippe's Vilmorin	Nov. 15	13.4	12.7	84.3	16.5	.81	320
Do	8235	Simon Legrand White Improved.	Nov. 15	14.3	13.6	80.8	15.0	.95	122
Do	8236	Bulteau Desprez Richest.	Nov. 15	12.1	11.5	82.3	14.1	.86	163
Do	8237	Florimond Desprez Richest.	Nov. 15	11.0	10.5	......	15.3	.72	125
Do	8238	Klein Wanzlebener	Nov. 15	14.9	14.2	......	19.4	.77	100
Do	8239	Dippe's Vilmorin	Nov. 15	13.0	12.4	83.3	14.4	.90	450
Do	8240	Simon Legrand White Improved.	Nov. 15	9.9	9.4	75.6	11.1	.90	305
Do	8241	Bulteau Desprez Richest.	Nov. 15	12.2	11.6	75.8	10.4	1.17	390

MARYLAND—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Prince George's County—Continued.									
				P. ct.	*P. ct.*			*P. ct.*	*Gr'ms.*
Maryland Agricultural Experiment Station.	8242	Florimond Desprez Richest.	Nov. 15	10.9	10.4	76.3	11.0	.99	335
Do	8243	Klein Wanzlebener	Nov. 15	13.1	12.5	84.0	12.7	1.03	305
Do	8244	Dippe's Vilmorin	Nov. 15	14.0	13.3	90.3	19.4	.72	145
Do	8245	Simon Legrand White Improved.	Nov. 15	14.2	13.5	......	19.7	.72	155
Do	8246	Bulteau Desprez Richest.	Nov. 15	11.4	10.8	87.7	18.1	.63	350
Do	8247	Florimond Desprez Richest.	Nov. 15	11.2	10.6	80.0	14.5	.77	205
Do	8248	Klein Wanzlebener	Nov. 15	13.2	12.5	......	17.1	.77	125
Do	8249	Vilmorin	Nov. 15	15.4	14.6	82.8	24.4	.63	555
Do	8250	Simon Legrand White Improved.	Nov. 15	12.6	12.0	77.8	12.7	.99	380
Do	8251	Bulteau Desprez Richest.	Nov. 15	13.7	13.0	81.1	17.8	.77	240
Do	8252	Florimond Desprez Richest.	Nov. 15	11.8	11.2	79.2	12.4	.95	220
Do	8253	Klein Wanzlebener	Nov. 15	12.3	11.7	78.4	15.2	.81	345
Do	8254	Dippe's Vilmorin	Nov. 15	15.1	14.4	86.3	19.6	.77	245
Do	8255	Simon Legrand White Improved.	Nov. 15	12.7	12.1	76.9	14.1	.90	260
Do	8256	Bulteau Desprez Richest.	Nov. 15	11.4	10.8	75.5	9.7	1.17	460
Do	8257	Florimond Desprez Richest.	Nov. 15	8.0	7.6	68.4	7.4	1.08	445
Do	8258	Klein Wanzlebener	Nov. 15	12.9	12.3	76.8	14.4	.90	190
Do	8259	do	Nov. 15	12.0	11.4	78.4	13.9	.86	200
Do	8260	Florimond Desprez Richest.	Nov. 15	12.2	11.6	73.5	12.3	.99	240
Do	8438	Dippe's Vilmorin	Dec. 4	22.0	21.0	......	34.9	.63	90
Do	8439	Bulteau Desprez Richest.	Dec. 4	18.4	17.5	......	23.9	.77	40
Do	8440	Florimond Desprez	Dec. 4	20.0	19.0	......	27.8	.72	58
Do	8441	Klein Wanzlebener	Dec. 4	19.8	18.8	......	22.0	.90	63
Do	8442	Dippe's Vilmorin	Dec. 4	19.9	18.9	94.8	20.9	.95	375
Do	8443	Simon Legrand White Improved.	Dec. 4	17.6	16.7	91.2	19.6	.90	213
Do	8444	Bulteau Desprez Richest.	Dec. 4	17.8	16.9	84.8	19.8	.90	163
Do	8445	Florimond Desprez Richest.	Dec. 4	13.6	12.9	83.4	12.6	1.08	238
Do	8446	Klein Wanzlebener	Dec. 4	17.4	16.5	......	17.6	.99	125
Average				12.9	12.3	79.7	15.1	.90	416
J. H. Williams	8175	Sugar beet	Nov. 8	10.0	9.5	69.4	8.3	1.21	415
Do	8176	Extra Eclipse	Nov. 8	8.9	8.5	60.1	7.6	1.17	253
Average				9.5	9.0	64.7	8.0	1.19	334

MASSACHUSETTS.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Hampshire County.									
Massachusetts State Experiment Station.	8030	Simon Legrand White Imp.	Oct. 27	11.1	10.6	81.6	13.7	.81	430
Do	8031	Dippe's Vilmorin	Oct. 27	11.8	11.2	80.3	12.4	.95	518
Do	8032	Klein Wanzlebener	Oct. 27	13.3	12.6	86.9	14.9	.90	340
Do	8033	Bulteau Desprez Richest.	Oct. 27	9.8	9.3	80.7	10.3	.95	458
Do	8034	Florimond Desprez	Oct. 27	13.2	12.5	84.7	16.3	.81	595
Average				11.8	11.2	82.8	13.5	.88	468
Suffolk County.									
W. H. Tenney & Co	8139		Nov. 5	16.8	16.0	82.8	17.0	.99	350

MICHIGAN.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Clinton County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
George Archer	7887	Klein Wanzlebener	Oct. 16	12.9	12.3	81.7	15.9	.81	745
Do	7888	Florimond Desprez Richest.	Oct. 16	11.2	10.6	72.7	15.6	.72	780
Average				12.1	11.5	77.2	15.8	.77	.763
Eaton County.									
D. J. McCargan	8278	Florimond Desprez	Nov. 18	9.0	8.6		8.7	1.03	167
Do	8279	Klein Wanzlebener	Nov. 18	10.2	9.7		10.3	.99	207
Average				9.6	9.1		9.5	1.01	187
Gratiot County.									
William Howe	7989	Klein Wanzlebener	Oct. 25	14.6	13.9		14.8	.99	550
Do	7990	do	Oct. 25	13.7	13.0		12.0	1.17	300
C. Boyd	8212	do	Nov. 14	9.3	8.8	70.5	9.0	1.03	1,750
Do	8213	Simon Legrand	Nov. 14	14.0	13.3	80.9	14.1	.99	1,470
Average				12.9	12.3	75.7	12.5	1.05	1,018
Huron County.									
W. P. Hatheway	7855	Klein Wanzlebener	Oct. 13	11.7	11.1	74.7	9.8	1.20	1.282
Ingham County.									
William Potter	8269	Klein Wanzlebener	Nov. 17	13.1	12.5	76.6	10.3	1.26	1,515
Ionia County.									
Dr. E. J. Howe	7696	Lemaire	Oct. 6	17.7	16.8	84.7	21.6	.82	387
Do	7706	Klein Wanzlebener	Oct. 6	14.2	13.5	81.1	14.2	1.00	443
Average				16.0	15.2	82.9	17.9	.91	415
Lenawee County.									
W. R. Osborn	7902	White Sugar	Oct. 17	8.6	8.2	60.6	8.7	.99	2,475
Do	7903	do	Oct. 17	8.2	7.8	60.3	10.1	.81	1,910
Average				8.4	8.0	60.5	9.4	.90	2,193
Macomb County.									
J. S. Lawson	8047	Klein Wanzlebener	Oct. 29	16.8	16.0	89.8	28.5	.59	680
Do	8048	Simon Legrand	Oct. 29	15.5	14.7	85.2	18.0	.86	705
Average				16.2	15.4	87.5	23.3	.73	693
Muskegon County.									
M. B. Averill	7633	Florimond Desprez	Sept. 29	10.0	9.5	70.4	8.3	1.21	365
Do	7634	Klein Wanzlebener	Sept. 29	14.2	13.4	80.2	14.3	.99	297
Jno. McNitt	7643	do	Oct. 1	13.7	13.0	80.5	17.8	.77	415
Do	7644	Florimond Desprez	Oct. 1	11.8	11.2	80.8	13.7	.86	542
Wm. Hartmann	7676		Oct. 4	12.9	12.3	81.7	11.0	1.17	400
Henry Paulman	7677	Florimond Desprez	Oct. 4	13.8	13.1	85.2	18.7	.74	735
Do	7678	Klein Wanzlebener	Oct. 4	14.3	13.6	85.1	20.1	.71	1,045
Do	7690		Oct. 4	12.7	12.1	83.0	14.6	.87	1,015
Orange Daggett	7971	Florimond Desprez	Oct. 24	9.9	9.4	78.5	10.4	.95	1,450
Do	7972	Klein Wanzlebener	Oct. 24	10.6	10.1	75.7	8.8	1.21	1,070
J. R. Devenport	8284	Russian	Nov. 19	16.4	15.6	89.1	17.2	.95	355
Average				12.8	12.2	80.9	14.1	.95	699
St. Clair County.									
Fritz Sagate	8431		Dec. 1	10.5	99.8	71.5	8.3	1.21	1,660
Saginaw County.									
J. D. Clarke	7999	Klein Wanzlebener	Oct. 25	14.2	13.5	87.1	17.5	.81	720
Do	8112	Florimond Desprez	Nov. 3	12.9	12.3	76.8	11.9	1.08	825
Average				13.6	12.9	82.0	14.7	.95	773

MINNESOTA.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Anoka County.									
				P. ct.	P. ct.			P. ct.	Gr'ms.
John Hunter	7658		Oct. 2	12.3	11.7	75.5	10.1	1.19	440
Do	7659		Oct. 2	15.9	15.1	84.1	17.2	.93	680
S. Barstow	7705		Oct. 6	14.9	14.2	85.0	16.4	.91	735
John Hunter	7707		Oct. 6	16.3	15.5	82.3	18.3	89	387
L. J. Carpenter	7708		Oct. 6	12.0	11.3	76.4	11.3	1.06	607
F. A. Edgerton	7712	Klein Wanzlebener	Oct. 6	14.1	13.4	77.0	16.6	.85	407
A. J. Smith	7715		Oct. 6	13.5	12.9	76.2	14.5	.93	750
S. A. Farrington	7716		Oct. 6	10.5	10.0	63.6	7.2	1.45	617
Joseph Ridge	7717	Klein Wanzlebener	Oct. 6	10.8	10.3	74.5	10.8	1.14	590
Edward Stack	8006	do	Oct. 27	12.7	12.1	72.6	11.2	1.14	1,160
Average				13.3	12.6	76.72	13.4	1.05	637
Becker County.									
Hans Jagers	8062	Sugar	Oct. 30	15.0	14.3	77.3	11.8	1.26	1,060
Do	8063	do	Oct. 30	13.7	13.0	74.9	12.7	1.08	1,200
Do	8064	French sugar	Oct. 30	9.7	9.2	68.8	6.6	1.48	1,970
Average				12.8	12.2	73.7	10.4	1.27	1,410
Blue Earth County.									
B. W. Sower	7608	Klein Wanzlebener	Sept. 26	13.4	12.7	80.2	13.2	.99	480
Do	7609	Florimond Desprez Richest.	Sept. 26	11.3	10.7	76.8	11.4	.99	500
Do	7610	Klein Wanzlebener	Sept. 26	10.9	10.4	74.1	9.7	1.12	587
F. W. Lossow	7629	Florimond Desprez	Sept. 29	7.9	7.6	60.3	6.5	1.21	1,135
Do	7630	Lemaire Richest	Sept. 29	11.4	10.8	77.6	11.1	1.03	955
Chas. Bennett	7649	do	Oct. 10	11.5	10.9	73.2	9.0	1.28	523
Do	7650	Florimond Desprez	Oct. 10	10.6	10.1	74.1	9.6	1.11	693
Gilbert Guttersen	7918		Oct. 18	11.1	10.6	76.1	12.3	.90	500
Average				11.0	10.5	74.1	10.4	1.08	684
Brown County.									
Herman Pfaender	7660	Florimond Desprez	Oct. 3	7.7	7.4	66.4	7.3	1.06	1,370
Do	7665	Klein Wanzlebener	Oct. 3	10.1	9.5	69.7	7.8	1.29	945
Average				8.9	8.5	68.1	7.6	1.18	1,158
Carver County.									
Leonhard Ziermann	7753	Klein Wanzlebener	Oct. 9	15.8	15.0	81.0	15.2	1.04	503
Do	7754	Florimond Desprez	Oct. 9	13.2	12.5	77.5	12.7	1.04	642
G. Tenbert	7968	Bohemian	Oct. 24	9.2	8.7	65.7	6.4	1.44	1,640
Do	7969		Oct. 24	8.2	7.8	60.0	4.8	1.71	1,020
Average				11.6	11.0	71.1	9.8	1.31	951
Chisago County.									
Eric Jonason	7631	Klein Wanzlebener	Sept. 29	12.2	11.6	75.3	10.4	1.17	680
Do	7632	Florimond Desprez	Sept. 29	15.1	14.4	79.5	14.0	1.08	495
L. J. Stark	7866		Oct. 14	13.8	13.1	80.2	15.2	.91	650
Do	7867		Oct. 14	12.7	12.1	80.9	9.8	1.30	1,265
L. O. Tombler	7983		Oct. 24	13.9	13.2	83.7	15.4	.90	1,525
Average				13.5	12.9	79.9	12.9	1.07	923
Clay County.									
C. B. Kittredge	8205	Klein Wanzlebener	Nov. 12	13.6	12.9	73.9	9.1	1.48	865
Do	8430		Dec. 1	13.7	13.0	76.5	13.3	1.03	665
Average				13.7	13.0	75.2	11.2	1.26	765
Cottonwood County.									
Simon Huntington	8007	Florimond Desprez	Oct. 27	15.6	14.8	72.9	10.8	1.44	675
Do	8008	do	Oct. 27	10.3	9.8	62.4	5.9	1.75	1,120
Average				13.0	12.3	67.7	8.4	1.60	898

MINNESOTA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Dakota County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
H. W. Koch	8110	German sugar	Nov. 3	16.7	15.9	84.4	14.3	1.17	400
Do	8111	French sugar	Nov. 3	14.0	13.3	77.8	9.0	1.44	333
Average				15.3	14.6	81.1	11.6	1.31	367
Faribault County.									
C. H. Culver	8459		Dec. 6	9.6	9.1	66.2	6.3	1.53	880
Do	8460		Dec. 6	10.9	10.4	63.0	5.2	2.11	865
Average				10.3	9.8	64.6	5.8	1.82	873
Fillmore County.									
Dr. C. H. Robbins	7812	Simon Legrand	Oct. 13	9.7	9.2	56.0	5.9	1.64	1,262
D. J. Tew	8114	Brabant	Nov. 3	14.2	13.7	83.2	15.2	.95	390
Average				12.0	11.4	74.6	10.5	1.30	826
Goodhue County.									
Edward A. Donnell	7788	Klein Wanzlebener	Oct. 11	16.9	16.1	86.7	18.2	.93	447
William Hagman	8125	White sugar	Nov. 4	8.2	7.8	63.1	5.5	1.48	1,025
J. G. Stearns	8188	Klein Wanzlebener	Nov. 10	10.5	10.0	75.6	9.0	1.17	930
George W. Judd	8189	....do	Nov. 10	8.9	8.5	63.6	7.4	1.25	815
Mrs. James Guero	8190	....do	Nov. 10	11.7	11.1	64.4	7.9	1.48	390
R. P. Thacher	8416	....do	Nov. 24	12.7	12.1	73.4	7.8	1.62	520
Average				11.5	10.9	71.1	9.3	1.32	685
Hennepin County.									
Olaf Johnson	7948		Oct. 22	14.7	14.0	92.5	14.9	.99	780
Hans Burlingame	7949		Oct. 22	12.5	11.9	69.4	8.2	1.53	940
George Dawthwaite	8132	Klein Wanzlebener	Nov. 4	9.4	8.9	68.6	7.5	1.26	1,560
Do	8133	Florimond Desprez	Nov. 4	9.7	9.2	69.8	7.5	1.30	576
Peter Weinand	8151		Nov. 6	16.5	15.7	79.3	15.3	1.08	817
William H. Loverin	8171	Klein Wanzlebener	Nov. 8	15.6	14.8	87.2	15.8	.99	600
Average				13.1	12.4	77.8	11.5	1.19	1,216
Houston County.									
Herman Pederson	7620	Klein Wanzlebener	Sept. 20	13.7	13.0	80.6	12.7	1.08	510
Isante County.									
Gaulbey & Anderson	8196		Nov. 11	10.9	10.4	67.9	8.7	1.26	1,445
N. A. Ahlstrom	7790	Klein Wanzlebener	Oct. 11	9.8	9.3	68.0	6.6	1.48	1,925
Do	7791	Simon Legrand	Oct. 11	10.8	10.3	75.5	8.9	1.24	1,500
Average				10.5	10.0	70.5	8.1	1.33	1,623
Le Sueur County.									
J. C. Swain	7798		Oct. 11	11.8	11.2	74.2	8.8	1.34	500
Do	7799		Oct. 11	11.0	10.5	71.9	13.6	.81	515
Average				11.4	10.8	73.2	11.2	1.08	508
Lincoln County.									
A. J. Crain	8104	Klein Wanzlebener	Nov. 3	13.2	12.5	73.7	10.9	1.21	1,513
Do	8105	Florimond Desprez Richest.	Nov. 3	12.7	12.1	72.6	9.3	1.30	1,173
Average				13.0	12.3	73.2	10.4	1.26	1,343
Lyon County.									
Andrew De Sutter	8126	Klein Wanzlebener	Nov. 4	13.7	13.0	72.5	9.7	1.44	500
Do	8127		Nov. 4	17.6	16.7	83.8	11.5	1.53	480
Average				15.7	14.9	78.2	10.6	1.49	490

MINNESOTA—Continued.

Name of grower.	Serial No	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
McLeod County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
Daniel Devitt	7651	Florimond Desprez Richest.	Oct. 2	10.0	9.5	69.4	7.5	1.34	1,090
Do	7652	Klein Wanzlebener	Oct. 2	13.0	12.3	77.9	12.7	1.02	795
Average				11.5	10.9	73.7	10.1	1.18	943
Marshal County.									
N. Bjorge	7657	Klein Wanzlebener	Oct. 2	8.9	8.5	66.9	6.5	1.37	740
Martin County.									
William H. Budd	7877	Klein Wanzlebener	Oct. 15	15.0	14.3	85.2	13.9	1.08	730
Do	7878	Florimond Desprez	Oct. 15	10.3	9.8	70.5	7.9	1.30	735
Nelson Bouse	7959	Klein Wanzlebener	Oct. 23	12.9	12.3	76.4	9.6	1.35	725
Do	7960	Florimond Desprez	Oct. 23	9.0	8.6	64.3	15.4	1.39	620
Henry Anderman	7963		Oct. 23	12.7	12.1	76.5	10.9	1.17	850
William Suter	8070		Oct. 30	9.0	8.4	64.7	6.5	1.39	1,670
Do	8071		Oct. 30	13.4	12.7	77.0	9.3	1.44	895
Average				11.8	11.2	73.5	10.5	1.30	889
Meeker County.									
E. Evenson	7768	Lemaire	Oct. 10	11.1	10.6	74.0	9.0	1.24	515
Do	7769	Florimond Desprez	Oct. 10	12.0	11.4	75.9	10.4	1.15	535
Average				11.6	11.0	75.0	9.7	1.15	525
Murray County.									
George B. Stiles	8076		Oct. 30	13.3	12.4	86.1	12.0	1.08	600
Do	8077		Oct. 30	12.6	12.0	84.6	11.3	1.12	440
V. H. Maxwell	8208		Nov. 14	18.6	17.7	84.3	19.6	.95	279
James Taylor	8209		Nov. 14	18.7	17.8	82.4	18.2	1.03	280
Do	8218		Nov. 14	17.1	16.3	84.7	17.3	.99	475
Average				16.1	15.2	84.4	15.7	1.03	415
Nicolet County.									
Fritz Virth	7955		Oct. 23	13.7	13.0	75.6	9.3	1.48	612
Noble County.									
J. P. Moulton	8092	White	Nov. 1	13.8	13.1	76.2	11.4	1.21	1,060
Do	8093		Nov. 1	13.7	13.0	76.6	12.2	1.12	1,475
Average				13.8	13.1	76.4	11.8	1.17	1,268
Pipestone County.									
J. J. Barnard	8094	Holland	Nov. 1	10.3	9.8	67.4	7.6	1.35	933
Do	8095		Nov. 1	12.9	12.3	74.6	10.2	1.26	1,375
Average				11.6	11.0	71.0	8.9	1.31	1,154
Ramsey County.									
Minnesota Experiment Station.	8287	Klein Wanzlebener	Nov. 20	11.2	10.6	81.8	13.8	.81	783
Do	8288	Bulteau Desprez Richest.	Nov. 20	10.8	10.3	77.1	12.0	.90	900
Do	8289	Simon Legrand White Improved.	Nov. 20	10.9	10.4	74.2	14.2	.77	653
Do	8290	Dippe's Vilmorin	Nov. 20	12.9	12.3	89.6	19.0	.68	873
Do	8291	Florimond Desprez	Nov. 20	9.4	8.7	83.2	12.2	.77	1,035
Do	8292	Vilmorin Sugar	Nov. 20	10.8	10.3	77.7	12.6	.86	635
Do	8293	White Sugar, Gregory	Nov. 20	10.1	9.6	83.4	12.5	.81	770
Do	8294	Improved Imperial	Nov. 20	8.0	7.6	74.8	9.3	.86	1,185
Do	8295	Excelsior Sugar	Nov. 20	11.3	10.7	82.7	12.6	.90	805
Do	8296	Lane's Gregory	Nov. 20	8.5	8.1	......	7.9	.08	650
Do	8297	Lane's Improved Sugar	Nov. 20	9.9	9.4	80.5	10.4	.95	870
Do	8298	Vilmorin White Imp.	Nov. 20	9.7	9.2	86.1	10.2	.95	796
Average				11.1	10.6	81.0	12.2	.86	830

MINNESOTA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Rock County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
J. F. Shoemaker	8150	Klein Wanzlebener	Nov. 6	14.2	13.5	79.3	12.7	1.12	870
Steele County.									
Clark Chambers	8027	Florimond Desprez	Oct. 27	8.5	8.1	60.3	7.6	1.12	1,230
Do	8272	....do	Nov. 17	11.0	10.5	74.8	8.7	1.26	855
Average				9.8	9.3	67.6	8.2	1.19	1,043
Travers County.									
H. C. Bartlet	8102	German Legrand	Nov. 3	18.3	17.4	79.2	14.1	1.30	840
Do	8103	....do	Nov. 3	17.5	16.6	73.3	14.6	1.21	575
Average				17.9	17.0	76.3	14.4	1.26	708
Wabash County.									
John Ween	7641	Florimond Desprez	Sept. 29	10.3	9.8	71.0	7.1	1.44	280
Washington County.									
Roger S. McIntosh	8018	Florimond Desprez	Oct. 27	11.3	10.7	79.5	10.7	1.08	810
Do	8019	Klein Wanzlebener	Oct. 27	13.6	12.9	80.5	13.5	1.03	710
Henry B. Vollner	8169	French Beet	Nov. 7	11.7	11.1	69.2	7.7	1.53	1,790
Average				11.2	10.6	76.4	10.6	1.21	1103
Wilkins County.									
Robt. Glover	7606	Dutch	Sept. 24	15.4	14.6	80.6	15.6	.99	447
Wright County.									
C. W. Judson	7967	Klein Wanzlebener	Oct. 24	10.5	10.0	71.4	8.1	1.30	910
County unknown.									
Henry Hillesheim	8437		Dec. 2	6.6	6.3	61.7	4.6	1.44	2,053

MISSOURI.

Bates County.									
Jacob Blocher	7900	White Silesian	Oct. 17	9.1	8.7	66.9	8.4	1.08	500
Do	7901	French Sugar	Oct. 17	8.4	8.0	66.7	7.8	1.08	700
Average				8.8	8.4	66.7	8.2	1.08	600

NEBRASKA.

Antelope County.									
F. H. Trowbridge	7366		Sept. 22	16.1	15.3	82.1	16.9	.95	241
Do	7367		Sept. 22	15.9	15.0	81.5	16.7	.95	226
Do	7368		Sept. 22	16.6	15.8	88.8	16.1	1.03	176
Do	7369		Sept. 22	18.8	17.9	81.8	18.3	1.03	119
C. A. Hathaway	7672	Florimond Desprez Richest.	Oct. 4	13.1	12.4	75.2	9.8	1.34	455
Do	7673	Klein Wanzlebener	Oct. 4	14.1	13.4	......	9.0	1.55	200
Do	7674	Florimond Desprez Richest.	Oct. 4	10.3	9.8	70.9	7.6	1.36	885
Do	7675	Klein Wanzlebener	Oct. 4	16.0	15.3	......	13.6	1.18	265
E. L. Heneway	7697	....do	Oct. 6	14.3	13.4	77.3	11.1	1.29	755
Do	7698	Florimond Desprez	Oct. 6	12.2	11.6	77.7	10.3	1.18	410
N. Cosby	7725		Oct. 7	13.3	12.6	70.4	12.2	1.09	250
Do	7729	Improved White	Oct. 7	9.0	8.6	72.0	8.4	1.07	382

NEBRASKA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Antelope County— Continued.				P. ct.	P. ct.			P. ct.	Gr'ms.
C. E. Heneway	7732	Klein Wanzlebener	Oct. 8	7.9	7.5	63.4	4.8	1.64	920
Do	7733	Florimond Desprez	Oct. 8	9.2	8.7	65.3	6.4	1.45	540
C. M. Wyman	7742	Klein Wanzlebener	Oct. 8	10.9	10.4	65.7	7.0	1.56	440
Do	7743	Florimond Desprez	Oct. 8	12.1	11.5	65.7	5.3	2.28	430
James Lewelan	7751		Oct. 9	10.6	10.1	50.2	7.8	1.36	357
Do	7752		Oct. 9	10.9	10.4	......	8.8	1.24	170
George Brokaw	7863		Oct. 14	10.7	10.2	68.2	11.5	.93	491
W. H. Cormeny	7997	Florimond Desprez	Oct. 25	16.5	15.7	86.4	16.7	.99	380
Do	7998		Oct. 25	10.3	9.8	76.8	13.5	1.08	280
Carl Roben	8086		Oct. 31	14.6	13.9	78.1	13.0	1.12	680
Do	8087	Simon Legrand	Oct. 31	13.9	13.2	79.8	12.9	1.08	520
Do	8088	Klein Wanzlebener	Oct. 31	13.6	12.9	80.5	14.3	.95	565
Do	8089	Desprez	Oct. 31	12.5	11.9	73.6	9.0	1.39	490
Do	8090	Lemaire	Oct. 31	14.6	13.9	......	11.2	1.30	350
Do	8091	Lane's Imperial	Oct. 31	13.1	12.5	......	9.4	1.39	320
E. Adams	8109	Vilmorin	Nov. 3	16.7	15.9	80.7	10.0	1.67	400
K. C. Edwards	8115		Nov. 3	14.4	13.7	81.4	12.9	1.12	458
Average				13.2	12.5	74.7	10.2	1.26	419
Banner County.									
Wm. Everett	7392	French Beet	Sept. 24	10.8	10.3	66.2	8.3	1.30	710
Do	7393	do	Sept. 24	11.4	10.8	68.3	10.6	1.08	693
Thos. H. Wilson	8026	Vilmorin	Oct. 27	14.0	13.3	76.9	9.7	1.44	435
Average				12.1	11.4	70.4	9.5	1.27	612
Blaine County.									
H. Heitholt	8051	Klein Wanzlebener	Oct. 29	14.6	13.9	78.1	11.6	1.26	610
Do	8052	Florimond Desprez	Oct. 29	11.9	11.3	74.4	9.4	1.26	550
Average				13.3	12.6	76.3	10.5	1.26	580
Boone County.									
C. D. Dean	7819	Desprez	Oct. 13	9.1	8.6	68.6	6.3	1.45	350
Do	7820	Lemaire	Oct. 13	8.1	7.7	65.3	5.5	1.48	435
Anton Ankle	7821	Simon Legrand	Oct. 13	13.3	12.6	72.2	10.3	1.30	685
Do	7822	Lemaire	Oct. 13	13.3	12.6	71.6	12.7	1.05	995
Lewis Leslie	7823		Oct. 13	12.8	12.2	73.6	10.3	1.24	820
Do	7824	Simon Legrand	Oct. 13	11.4	10.8	67.8	10.2	1.12	500
Do	7825	Klein Wanzlebener	Oct. 13	14.3	13.6	88.3	11.7	1.22	820
Do	7826	Desprez	Oct. 13	10.7	10.2	......	7.8	1.34	515
Do	7827	Lemaire	Oct. 13	10.1	9.6	67.3	6.9	1.46	720
J. B. Green	7828		Oct. 13	7.6	7.2	57.6	4.3	1.77	445
Do	7829	Simon Legrand	Oct. 13	8.8	8.3	62.8	4.9	1.78	545
Do	7830	Klein Wanzlebener	Oct. 13	9.5	9.0	65.9	5.9	1.60	735
J. E. Green	7831	Desprez	Oct. 13	8.7	8.2	65.4	5.3	1.64	485
T. C. Williams	7832		Oct. 13	11.9	11.3	......	10.8	1.18	225
Do	7833	Simon Legrand	Oct. 13	14.2	13.5	......	11.5	1.23	340
Do	7834	Klein Wanzlebener	Oct. 13	8.9	8.5	71.2	8.2	1.09	645
Do	7835	Desprez	Oct. 13	8.1	7.7	62.3	4.4	1.86	410
Do	7836	Lemaire	Oct. 13	11.7	11.1	75.0	10.9	1.07	585
G. M. Limard	7837		Oct. 13	10.7	10.2	68.2	10.0	1.07	725
Do	7838	Simon Legrand	Oct. 13	10.3	9.8	66.0	9.0	1.15	765
Do	7839	Klein Wanzlebener	Oct. 13	13.3	12.6	76.8	10.1	1.21	765
Do	7840	Desprez	Oct. 13	11.7	11.1	74.7	15.0	.78	740
Do	7841	Lemaire	Oct. 13	12.0	11.4	81.1	12.0	1.00	640
M. G. Curtis	7842		Oct. 13	12.3	11.7	......	10.5	1.17	280
Do	7843	Simon Legrand	Oct. 13	13.2	12.5	......	10.5	1.26	270
Do	7844	Klein Wanzlebener	Oct. 13	10.8	10.4	......	7.1	1.53	365
Do	7845	Desprez	Oct. 13	12.4	11.8	......	8.2	1.51	165
H. H. Howard	7846		Oct. 13	11.4	10.8	72.2	8.5	1.34	510
Do	7847	Simon Legrand	Oct. 13	8.8	8.4	62.3	5.9	1.50	590
Do	7848	Klein Wanzlebener	Oct. 13	8.2	7.8	63.5	5.6	1.46	630
Do	7849	Desprez	Oct. 13	9.2	8.7	64.5	12.5	.74	670
Ed. Popper	7850		Oct. 13	9.9	9.4	70.7	8.1	1.23	595
Do	7851	Simon Legrand	Oct. 13	11.4	10.8	76.5	11.5	.99	405
Do	7852	Klein Wanzlebener	Oct. 13	10.1	9.6	71.2	9.0	1.12	455
Do	7853	Desprez	Oct. 13	9.6	9.1	63.2	7.9	1.24	790
Do	7854	Lemaire	Oct. 13	7.0	6.6	62.1	5.1	1.37	620
Average				10.7	10.1	69.2	8.7	1.29	550

NEBRASKA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Box Butte County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
A. S. Darling	7746	Vilmorin	Oct. 9	12.9	12.3	72.5	9.3	1.39	825
Do	7765	Klein Wanzlebener	Oct. 10	14.4	13.7	76.2	10.6	1.39	820
P. W. Tracy	7801	do	Oct. 11	15.0	14.3	68.5	10.0	1.50	407
M. W. Nye	7802	Florimond	Oct. 11	10.3	9.8	69.1	7.4	1.40	513
J. A. Heist	7803	Klein Wanzlebener	Oct. 11	14.7	14.0	69.4	10.1	1.45	650
H. W. Axtell	8009	Klein Wanzlebener, Dippe's.	Oct. 27	9.7	9.2	74.0	8.0	1.21	785
Average				12.8	12.2	71.6	9.2	1.39	666
Brown County.									
W. H. Carey	7868	Desprez	Oct. 10	10.6	10.1	69.7	7.0	1.51	350
Butler County.									
Elizabeth Bales	7668	Lemaire Legrand	Oct. 3	12.6	12.0	68.9	10.9	1.16	260
Do	7669	do	Oct. 3	14.0	13.3		11.8	1.19	230
Average				13.3	12.7	68.9	11.4	1.18	245
Chase County.									
E. J. Ledger	7744		Oct. 8	10.5	10.0	70.5	8.4	1.25	1380
Do	7745		Oct. 8	12.1	11.5	63.5	9.2	1.31	725
Miss D. Vroman	8012	Florimond Desprez, Richest.	Oct. 29	10.0	9.5	66.2	8.3	1.21	860
Do	8013	Klein Wanzlebener	Oct. 29	11.5	10.9	69.7	7.5	1.53	855
Peter Jones	8214	Florimond Desprez	Oct. 29	13.9	13.2	73.5	9.4	1.48	708
Do	8215	Klein Wanzlebener	Oct. 29	13.7	13.0	74.1	9.5	1.44	675
Lizzie Jones	8206	Florimond Desprez	Nov. 14	14.3	13.6	74.9	9.7	1.48	540
Do	8207	Klein Wanzlebener	Nov. 14	13.9	13.2	72.4	7.9	1.75	630
Average				12.4	11.7	70.6	8.7	1.43	796
Cherry County.									
John Benning	7376	Vilmorin	Sept. 24	9.0	8.6	55.2	4.5	2.00	455
Do	7377		Sept. 24	9.7	9.2	65.8	5.2	1.85	605
Average				9.4	8.9	60.5	4.9	1.92	530
Colfax County.									
H. M. Kemp	7880		Oct. 15	10.3	9.8	65.3	6.6	1.57	1,025
Do	7881		Oct. 15	10.9	10.4	70.3	6.9	1.57	850
John Schuldt	8001	Klein Wanzlebener	Oct. 25	13.6	12.9	77.3	11.2	1.21	500
J. B. Martin	8010	Dippe's Vilmorin	Oct. 27	15.4	14.6	81.9	14.3	1.08	523
Do	8011		Oct. 27	13.0	12.4	75.1	10.0	1.30	686
Joseph Praisler	8130	Florimond Desprez	Nov. 4	11.3	10.7	62.4	5.2	2.16	500
Do	8131	Klein Wanzlebener	Nov. 4	12.4	11.8	66.7	7.3	1.71	510
Average				12.4	11.8	71.3	8.8	1.51	661
Cuming County.									
Uriah Brumer	7907	Klein Wanzlebener	Oct. 18	10.8	10.3	67.9	8.3	1.30	475
Do	7908	Florimond Desprez	Oct. 18	10.9	10.4	71.7	8.7	1.26	910
Average				10.9	10.4	69.8	8.5	1.28	692
Custer County.									
W. O. Porter	7663	Vilmorin	Oct. 3	7.9	7.5	60.8	6.0	1.32	565
Do	7664	do	Oct. 3	8.8	8.4		5.4	1.63	305
J. D. Haskell	7679		Oct. 4	7.4	7.0	61.7	5.5	1.35	575
Do	7680		Oct. 4	5.6	5.3	52.3	2.9	1.96	575
Average				7.4	7.0	58.2	5.0	1.56	550
Dawes County.									
R. P. Gregg	7974	Florimond Desprez Richest.	Oct. 24	10.4	9.9	69.3	7.2	1.44	246
Do	7975	Klein Wanzlebener	Oct. 24	16.2	15.4	72.7	8.4	1.93	290
W. J. Hooker	8056	Vilmorin White	Oct. 29	13.7	13.0	77.9	9.5	1.44	340
Average				13.4	12.7	73.3	8.3	1.60	258

NEBRASKA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Dawson County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
Mrs. Ella Stanley	7927	Klein Wanzlebener	Oct. 20	10.8	10.3	69.7	6.7	1.62	840
Do	7928	do	Oct. 20	11.3	10.7	76.9	6.3	1.71	500
Average				11.0	10.5	73.3	6.5	1.66	670
Deuel County.									
G. W. Hultz	8028	Klein Wanzlebener	Oct. 27	19.8	18.8		12.2	1.62	248
Dodge County.									
E. Morell	7941	Vilmorin	Oct. 21	14.9	14.2	81.4	13.8	1.08	750
Chas. Osterman	8124		Nov. 4	16.3	15.5	83.2	15.8	1.03	450
Average				15.6	14.8	82.3	14.8	1.05	600
Dundy County.									
F. B. Moore	8427	Klein Wanzlebener, Dippe's.	Nov. 28	10.5	10.0	67.7	8.3	1.26	1565
Fillmore County.									
J. S. Beardsly	7684		Oct. 4	12.5	11.9	73.1	8.4	1.49	990
Do	7685		Oct. 4	11.2	10.6	67.9	6.8	1.65	710
Do	7686	Klein Wanzlebener	Oct. 4	13.5	12.8	71.1	8.4	1.61	640
Do	7687	Desprez	Oct. 4	12.1	11.5	65.8	6.1	1.98	410
Do	7688	Lemaire	Oct. 4	10.9	10.4	65.6	7.0	1.55	605
Average				12.0	11.6	68.7	7.3	1.66	677
Frontier County.									
A. E. Hill	7856		Oct. 13	9.8	9.3	66.7	7.5	1.31	895
Do	7857	Klein Wanzlebener	Oct. 13	12.9	12.3	66.8	11.3	1.14	355
Do	7858	Desprez	Oct. 13	12.0	11.4	72.3	9.5	1.22	435
G. L. Sherman	7859		Oct. 13	11.2	10.6	70.9	8.5	1.32	535
Do	7860	Desprez	Oct. 25	17.1	16.3	85.9	16.4	1.04	490
W. F. Sherman	7993	Vilmorin Improved	Oct. 25	15.7	14.9	81.3	12.1	1.30	350
Do	7994	Klein Wanzlebener	Oct. 25	11.8	11.2	76.6	8.7	1.35	660
Average				12.9	12.3	74.4	10.5	1.24	531
Furnas County.									
H. Montgomery	7681	Klein Wanzlebener	Oct. 4	12.0	11.4	71.4	7.7	1.55	565
Do	7682	Florimond Desprez	Oct. 4	13.0	12.4	74.7	9.4	1.39	247
W. B. Keith	7813	Klein Wanzlebener	Oct. 15	14.7	14.0	75.0	11.0	1.34	600
Do	7814	Florimond Desprez	Oct. 15	13.2	12.5	77.2	11.6	1.14	605
H. Montgomery	7932		Oct. 20	14.0	13.3	81.9	9.2	1.53	255
Average				13.4	12.7	76.0	9.8	1.39	454
Gage County.									
A. C. Wagner	7387	Klein Wanzlebener	Sept. 24	13.3	10.7	79.0	14.0	.81	610
Do	7388	do	Sept. 24	7.3	6.9	59.3	5.2	1.40	725
Do	7389	do	Sept. 24	12.0	11.4	6.55	13.3	.90	323
M. C. Blake	7702	Florimond Desprez	Oct. 6	8.1	7.7	67.5	6.6	1.23	1,245
E. Arnold	8400	Vilmorin	Nov. 21	10.7	10.2	71.3	8.2	1.30	705
Do	8401	Klein Wanzlebener	Nov. 21	10.0	9.5	69.0	7.7	1.30	715
Average				9.9	9.4	68.6	9.2	1.16	721
Garfield County.									
T. Crane	7699	Florimond	Oct. 6	14.6	13.9		11.3	1.29	260
Do	7700	do	Oct. 6	12.4	11.8		9.9	1.26	265
M O'Connor	7738	Vilmorin	Oct. 8	17.6	16.7	83.4	13.7	1.28	860
Do	7739	do	Oct. 8	13.4	12.7	82.5	11.7	1.15	700
M. Crane	7786	Florimond	Oct. 10	9.8	9.3	61.2	6.3	1.56	630
A. Phillips	7800		Oct. 11	13.2	12.5	72.0	9.9	1.34	483
Average				13.3	12.8	74.8	10.5	1.31	533

NEBRÁSKA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
Hall County.				*P. ct.*	*P. ct.*			*P. ct.*	*Grms.*
Hans Stodt	7891		Oct. 16	16.4	15.6	90.6	13.5	1.21	448
Fred Suehlsen	7893	German White	Oct. 16	17.5	16.6	87.1	17.7	.99	398
Average				16.9	16.1	88.8	15.6	1.10	423
Hamilton County.									
J. D. Evans	7655		Oct. 2	12.8	12.2	......	9.7	1.32	260
Do	7656		Oct. 2	15.1	14.4	......	13.1	1.15	210
Average				14.0	13.3	......	11.4	1.24	235
Harlan County.									
A. C. Robins	7383	Vilmorin	Sept. 24	12.2	11.6	70.2	9.9	1.25	255
Do	7384	Klein Wanzlebener	Sept. 24	13.1	12.5	71.1	10.5	1.25	160
Aug. Sasse	7904	do	Oct. 17	7.6	7.2	65.0	5.6	1.35	640
Do	7905	do	Oct. 17	11.9	11.3	......	10.6	1.12	255
Average				11.2	10.7	68.8	9.2	1.24	328
Hayes County.									
C. A. Ready	7816		Oct. 13	13.7	13.0	72.0	9.3	1.48	915
Do	7817		Oct. 13	17.3	16.4	79.7	12.5	1.39	590
Do	7818		Oct. 13	13.8	13.1	71.7	8.5	1.62	1,235
Average				14.9	14.2	74.5	10.1	1.49	913
Hitchcock County.									
Anthony Stark	7906	Klein Wanzlebener	Oct. 18	10.7	10.2	67.7	7.0	1.53	715
H. H. Taylor	8044	do	Oct. 28	13.1	12.5	72.0	8.6	1.53	380
Do	8045	Lemaire	Oct. 28	17.7	16.8	76.3	11.3	1.57	413
Do	8046	Desprez	Oct. 28	17.5	16.6	76.1	11.4	1.53	350
Average				14.7	14.0	73.0	9.6	1.54	464
Holt County.									
J. H. Gordon	7394		Sept. 24	9.0	8.6	66.2	7.1	1.26	1,945
Do	7395		Sept. 24	10.5	10.0	70.4	8.1	1.21	2,190
Thos. Wiggins	7694	Vilmorin	Oct. 6	14.1	13.4	75.8	11.3	1.25	600
Do	7695	do	Oct. 6	14.4	13.7	77.0	13.1	1.10	445
E. H. Benedict	7709	Klein Wanzlebener	Oct. 6	13.6	12.9	65.1	9.2	1.48	365
Do	7710	do	Oct. 6	19.8	18.8	......	12.7	1.56	205
Do	7711	do	Oct. 6	18.1	17.2	......	10.7	1.69	187
N. B. Bisbee	7713		Oct. 6	12.1	11.5	71.2	8.3	1.46	680
Do	7714	Vilmorin	Oct. 6	12.3	11.7	74.0	9.0	1.36	515
E. H. Benedict	7718	Florimond Desprez	Oct. 6	14.3	13.5	......	9.9	1.44	545
Do	7719	do	Oct. 6	14.8	13.8	......	6.7	2.23	177
Do	7720	do	Oct. 6	12.1	11.5	68.4	7.7	1.58	460
H. H. Saunders	7864		Oct. 14	12.5	11.9	75.8	10.0	1.23	1,690
Do	7865		Oct. 14	16.1	15.3	79.9	11.3	1.43	1,300
J. Gus. Kluck	7917		Oct. 18	13.1	12.5	80.9	10.8	1.21	860
W. B. Lower	8002	Imported White	Oct. 25	15.1	14.4	81.6	14.7	1.03	670
Edgar Bruner	8197		Nov. 11	20.4	19.4	73.9	10.8	1.89	220
Average				14.2	13.5	73.9	10.1	1.44	777
Howard County.									
C. T. Kenyon	7375	Klein Wanzlebener	Sept. 22	12.5	11.9	79.6	13.2	.95	810
Jefferson County.									
W. W. Watson	7910	Vilmorin	Oct. 18	11.6	11.0	69.5	8.0	1.44	328
Do	7911		Oct. 18	14.9	14.2	79.7	12.7	1.17	408
Do	7912	Lemaire	Oct. 18	12.2	12.6	72.2	9.0	1.35	365
Do	7913	Klein Wanzlebener	Oct. 18	13.1	12.5	74.9	9.4	1.39	450
Do	7914	Florimond Desprez	Oct. 18	9.5	9.1	63.3	6.4	1.48	655
A. Wilson	8414	Desprez	Nov. 24	13.3	12.6	72.3	9.2	1.44	413
J. G. Dougan	8415		Nov. 24	12.1	11.5	74.7	9.3	1.30	420
Average				12.4	11.8	72.4	9.1	1.37	434

NEBRASKA—Continued.

Name of grower.	Serial No.	Variety.	When received	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Kearney County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
Gus. Olson	7982	Klein Wanzlebener	Oct. 24	15.6	14.8	76.1	13.3	1.17	214
C. D. Emerson	8447	Lemaire Richest	Dec. 4	22.8	21.7	......	13.7	1.66	155
Do	8448	Klein Wanzlebener	Dec. 4	25.5	24.2	......	14.6	1.75	303
Average				21.3	20.2	76.1	13.9	1.53	224
Kimball County.									
M. Newingle	7646	White Improved	Oct. 1	11.4	10.8	70.4	7.9	1.44	227
Knox County.									
H. S. Morton	7640		Sept. 29	15.3	14.5	81.4	13.1	1.17	595
Carl Schindler	7862		Oct. 14	7.8	7.4	62.2	5.9	1.32	2,010
William Benner	7978	Klein Wanzlebener	Oct. 24	10.3	9.8	76.8	7.9	1.30	1,150
William Barnum	7979	do	Oct. 24	12.9	12.3	68.3	8.4	1.53	485
Do	7980	do	Oct. 24	10.2	9.7	68.5	9.0	1.35	100
Average				11.3	10.7	71.4	8.9	1.33	868
Lincoln County.									
Caspar Bolish	7358		Sept. 5	10.9	10.4	67.4	7.9	1.39	428
G. R. Gullera	7359		Sept. 5	12.7	12.1	73.9	12.3	1.04	177
W. S. Hawkins	7360		Sept. 5	14.1	13.4	70.5	11.4	1.24	236
Dr. Calvert	7361	Lane's Imperial	Sept. 6	5.8	5.5	60.4	4.9	1.18	980
T. Stimson	7611	Vilmorin	Sept. 26	12.5	11.8	76.7	10.7	1.17	857
C. C. Hawkins	7724	do	Oct. 7	13.9	13.2	79.4	14.9	.93	680
Do	7726		Oct. 7	12.9	12.3	77.2	10.8	1.19	710
J. Whiter	8000	Dippe's Vilmorin	Oct. 25	15.8	15.0	86.8	16.4	.90	930
J. H. Knowles	8268	Klein Wanzlebener	Nov. 17	19.8	18.8	82.8	14.7	1.35	515
Average				13.2	12.5	75.0	11.6	1.15	613
Loup County.									
H. W. Adams	7935	Florimond Desprez, Richest.	Oct. 21	10.5	10.0	67.3	6.0	1.75	675
Do	7936	do	Oct. 21	9.7	9.2	64.7	5.4	1.75	710
Average				10.1	9.6	66.0	5.7	1.75	692
McPherson County.									
D. P. Wilcox	7976	Klein Wanzlebener, Dippe's.	Oct. 24	11.7	11.1	75.0	11.8	.99	285
Do	7977	Florimond Desprez, Richest.	Oct. 24	14.3	13.6	77.3	11.3	1.26	190
Average				13.0	12.4	76.2	11.6	1.13	238
Madison County.									
D. R. Daniels	7921	Desprez	Oct. 20	10.4	9.9	71.7	8.9	1.17	580
Do	7922		Oct. 20	12.2	11.6	70.5	8.0	1.53	800
Do	7923	Vilmorin	Oct. 20	13.2	12.6	73.3	10.5	1.30	1,340
Do	7924	do	Oct. 20	11.2	10.6	72.7	8.6	1.30	655
T. J. Harter	7930	Klein Wanzlebener	Oct. 20	14.2	13.5	85.5	13.8	1.03	410
Average				12.2	11.6	74.7	10.0	1.26	523
Nuckolls County.									
G. G. Hedgecock	7378	Florimond Desprez, Richest.	Sept. 24	7.3	6.9	58.8	4.8	1.50	393
Do	7879	do	Sept. 24	10.8	10.3	69.2	9.0	1.20	390
Do	7380	Klein Wanzlebener, Dippe's.	Sept. 24	9.6	9.1	73.3	8.0	1.20	295
Do	7381	do	Sept. 24	8.2	7.8	68.3	6.6	1.25	320
Average				8.9	8.5	67.4	7.1	1.28	347

NEBRASKA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Pawnee County.				P. ct.	P. ct.			P. ct.	Gr'ms.
W. A. Hutchinson	7873	Desprez	Oct. 15	12.5	11.9	79.1	11.2	1.12	1,038
Do	7874	Klein Wanzlebener	Oct. 15	12.4	11.8	79.5	11.5	1.08	768
T. E. Tackley	7937	Legrand	Oct. 21	12.7	12.1	81.9	10.5	1.21	532
Do	7938	Florimond Desprez	Oct. 21	15.6	14.8	83.4	14.5	1.08	432
Average				13.3	12.7	80.5	11.9	1.12	693
Perkins County.									
Miss D. Vroman	7627	Florimond Richest	Sept. 29	10.7	10.2	71.8	7.6	1.40	1,147
Do	7628	do	Sept. 29	9.5	9.0	68.8	7.0	1.35	1,040
C. H. Purinton	7915	Klein Wanzlebener	Oct. 18	16.5	15.7	79.3	12.7	1.30	955
Do	7916	Dippe's Richest	Oct. 18	11.4	10.8	70.8	7.7	1.48	945
Dan Neff	7973	Klein Wanzlebener	Oct. 24	18.0	17.1	90.5	15.4	1.17	630
M. H. Hudson	7653		Oct. 2	12.3	11.7	71.1	9.0	1.54	760
Do	7654	Klein Wanzlebener	Oct. 2	12.3	11.7	72.4	8.0	1.54	520
Average				13.0	12.4	74.9	9.6	1.40	857
Phelps County.									
J. P. Olson	8219		Nov. 14	16.0	15.2	75.8	10.5	1.53	290
Do	8220	Simon Legrand	Nov. 14	12.7	12.1	67.9	6.6	1.94	360
Do	8221	Klein Wanzlebener	Nov. 14	11.9	11.3	66.9	6.2	1.93	490
Do	8222	Desprez	Nov. 14	11.2	10.6	70.4	6.9	1.62	255
Do	8223	Lemaire	Nov. 14	13.7	13.0	......	9.3	1.48	130
Average				13.1	12.4	70.2	7.9	1.70	305
Pierce County.									
U. S. Forbes	7981		Oct. 24	11.5	10.9	75.2	8.2	1.39	565
Platte County.									
Gerhard Ascke	8183		Nov. 8	12.3	11.7	71.1	8.9	1.39	365
Do	8184	Simon Legrand	Nov. 8	10.1	9.5		6.5	1.53	250
Do	8185	Klein Wanzlebener	Nov. 8	11.2	10.6	69.1	6.4	1.75	520
Do	8186	Lemaire Richest	Nov. 8	8.6	8.2	64.7	5.2	1.66	340
Average				10.6	10.0	68.3	6.8	1.58	369
Polk County.									
J. B. Dey	8003	Dippe's Vilmorin	Oct. 25	8.9	8.5	64.5	5.8	1.53	435
Do	8004	Florimond Desprez	Oct. 25	12.1	11.5	69.5	8.2	1.48	575
Do	8005	Klein Wanzlebener, Dippe's	Oct. 25	13.3	12.6	71.1	8.5	1.57	590
Average				11.4	10.9	68.4	7.5	1.53	533
Red Willow County.									
S. Bolles	7762		Oct. 10	5.3	5.0	48.1	2.6	2.05	1,235
Do	7763	White sugar	Oct. 10	11.9	11.3	74.3	14.5	.82	645
Average				8.6	8.1	61.2	8.6	1.43	940
Richardson County.									
B. Semanton	8145		Nov. 5	12.9	12.3	69.4	9.2	1.39	845
Do	8146	Simon Legrand	Nov. 5	10.9	10.4	66.2	10.6	1.03	630
Do	8147	Klein Wanzlebener	Nov. 5	10.2	9.7	66.2	6.1	1.67	740
Do	8148	Desprez	Nov. 5	7.4	7.0	59.7	5.9	1.26	815
Do	8149	Lemaire	Nov. 5	9.9	9.4	65.6	7.4	1.35	635
Average				10.3	9.8	65.4	7.8	1.34	733
Rock County.									
A. H. Gale	8211	Klein Wanzlebener	Nov. 14	15.2	14.4	83.1	12.1	1.26	400

NEBRASKA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Saline County.									
				P. ct.	P. ct.			P. ct.	Gr'ms.
F. J. Foss	8022	Florimond Desprez	Oct. 27	7.4	7.0	56.1	3.9	1.89	375
Do	8023	Klein Wanzlebener	Oct. 27	9.1	8.6	64.1	5.1	1.80	475
Average				8.3	7.8	60.1	4.5	1.85	425
Saunders County.									
W. Meyr	7727	Vilmorin	Oct. 7	11.2	10.6	69.6	4.8	2.34	825
Do	7728	do	Oct. 7	10.8	10.3	74.5	10.3	1.05	730
J. Gabriel	8128		Nov. 4	17.7	16.8		17.2	1.03	305
Do	8129		Nov. 4	15.3	14.5	83.2	14.9	1.03	370
Average				13.8	13.1	75.8	11.8	1.36	5,575
Scott Bluff County.									
William Gauser	8138		Nov. 5	23.9	22.7	83.3	15.6	1.5	333
Seward County.									
E. L. Blanchard	7382		Sept. 24	10.3	9.8	66.0	9.4	1.10	440
W. K. Kelley	7929	Vilmorin	Oct. 20	13.1	12.5	78.5	11.2	1.17	460
Average				11.7	11.2	72.3	10.3	11.4	450
Sheridan County.									
N. J. Cook	7623	Florimond Desprez	Sept. 27	9.3	8.8	68.4	5.7	1.62	455
Do	7624	do	Sept. 27	11.4	10.8	76.0	8.4	1.35	265
S. E. Ferguson	7625	do	Sept. 27	14.7	14.0	77.3	10.2	1.44	485
Do	7626	do	Sept. 27	10.5	10.0	71.4	8.3	1.26	568
C. A. Watterman	8014	Klein Wanzlebener, Dippe's.	Oct. 27	9.2	8.7	68.7	7.3	1.26	663
Do	8015	Florimond Desprez	Oct. 27	8.5	8.1	63.0	6.3	1.35	548
T. A. Fleming	8083		Oct. 31	7.5	7.1	54.7	4.4	1.71	700
Do	8084		Oct. 31	19.6	18.6	78.7	12.5	1.57	500
A. Richardson	8085		Oct. 31	15.8	15.0		10.6	1.53	340
Average				11.8	11.2	69.8	8.2	1.45	503
Thayer County.									
W. B. Hughes	8191		Nov. 10	12.7	12.1	77.5	11.8	1.08	870
Do	8192	Simon Legrand	Nov. 10	14.1	13.4	80.6	15.7	.90	1,060
Do	8193	Klein Wanzlebener	Nov. 10	11.2	10.6	74.2	9.3	1.21	1,595
Do	8194	Desprez	Nov. 10	13.6	12.9	76.4	11.2	1.21	645
Do	8195	Lemaire	Nov. 10	14.2	13.5	84.5	13.2	1.08	1,020
C. E. Ward	8451	Improved White Sugar	Dec. 6	14.6	13.9	66.4	8.5	1.71	315
Do	8452	Desprez	Dec. 6	12.7	12.1	71.8	8.8	1.44	403
Do	8453	Klein Wanzlebener	Dec. 6	16.9	16.1	77.9	12.2	1.39	335
Do	8454	Lemaire	Dec. 6	18.3	17.4	82.1	13.6	1.35	385
Do	8455	Desprez	Dec. 6	17.1	16.2	83.2	13.6	1.26	292
Do	8456	Klein Wanzlebener	Dec. 6	18.2	17.3	84.7	16.9	1.08	323
Do	8457	Lemaire	Dec. 6	14.1	13.4	75.4	9.8	1.44	495
Do	8458	Klein Wanzlebener	Dec. 6	15.9	15.1	76.4	9.5	1.62	500
Average				14.9	14.6	77.8	11.8	1.29	632
Valley County.									
E. W. Waterman	7804	Florimond Desprez	Oct. 11	10.2	9.7	68.9	7.0	1.45	460
Do	7805	Klein Wanzlebener	Oct. 11	12.0	11.4	69.4	8.1	1.48	547
Average				11.2	10.6	69.7	7.6	1.46	503
Wayne County.									
D. W. C. Hood	7621	Dippe's	Sept. 21	9.6	9.1	73.5	7.4	1.30	325
Do	7622	Klein Wanzlebener	Sept. 21	9.4	8.9	68.1	6.0	1.57	500
Average				9.5	9.0	70.8	6.7	1.44	413

NEBRASKA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
York County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
D. H. Reeder	8065		Oct. 30	9.8	9.3	62.0	7.3	1.35	620
Do.	8066	Simon Legrand	Oct. 30	13.9	13.2	73.9	10.3	1.35	450
Do.	8067	Klein Wanzlebener	Oct. 30	14.4	13.7	75.8	11.1	1.30	590
Do.	8068	Desprez	Oct. 30	14.7	14.0	75.0	13.1	1.12	530
Do.	8069	Lemaire	Oct. 30	11.1	10.6	68.9	10.3	1.08	560
Henry Smith	8417		Nov. 24	16.4	15.6	78.5	11.1	1.48	445
Do.	8418		Nov. 24	15.4	14.6	......	9.5	1.62	210
Do.	8419		Nov. 24	14.6	13.9	72.6	8.8	1.66	230
Do.	8420		Nov. 24	12.0	11.4	......	6.9	1.75	350
Average				13.6	12.9	79.4	9.8	1.41	443

NEW YORK.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Genesee County.									
A. D. Lemley	8261	Florimond White Red Top	Nov. 17	10.5	10.0	73.9	9.7	1.08	2,500
Do.	8262	Lane's or French Red Top	Nov. 17	15.0	14.3	83.3	18.5	.81	1,210
Do.	8263	Vilmorin Red Top	Nov. 17	12.8	12.2	82.1	14.7	.86	1,485
Average				12.8	12.2	79.4	14.3	.92	1,732
Oneida County.									
Henry Branstater	7875	Simon Legrand	Oct. 15	11.9	11.3	78.2	10.6	1.12	400
Do.	7876	Florimond Desprez	Oct. 15	11.5	10.9	70.3	11.2	1.03	445
Average				11.7	11.1	78.8	10.9	1.08	423
Warren County.									
F. H. Crumb	8216	Florimond Desprez	Nov. 14	15.3	14.5	87.0	17.0	.90	610
Do.	8217	Klein Wanzlebener	Nov. 14	13.8	13.1	81.7	12.8	1.08	675
Average				14.6	13.8	84.5	14.9	.99	643
Yates County.									
Robert Platman	7964	Dippe's Vilmorin	Oct. 24	12.3	11.7	72.4	11.4	1.08	405
Do	7965	Florimond Desprez	Oct. 24	10.7	10.2	67.7	16.1	1.04	465
Do.	7966	Simon Legrand	Oct. 24	12.9	12.3	75.0	14.3	.90	540
Average				12.0	11.4	71.7	13.9	10.1	470

NORTH DAKOTA.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Burleigh County.									
John Yegen	7635		Sept. 29	10.9	10.4	70.3	7.8	1.39	453
Cass County.									
J. R. Fuller	7647		Oct. 1	13.7	13.0	72.9	4.5	1.62	550
Do.	7648	Klein Wanzlebener	Oct. 1	13.2	12.5	74.2	10.2	1.29	575
M. Woodhull	7721		Oct. 6	8.3	7.9	59.2	4.6	1.80	1,102
G. N. Smith	8425	Klein Wanzlebener	Nov. 15	16.2	15.4	79.0	11.7	1.39	760
Do.	8426	Dippe's Vilmorin	Nov. 15	17.1	16.3	86.8	14.1	1.21	695
Average				13.7	13.0	75.5	9.0	1.56	736
Dickey County.									
Charles Stekl	7991	Florimond Desprez	Oct. 25	10.5	10.0	67.3	6.3	1.66	1,050
Do.	7992	Klein Wanzlebener	Oct. 25	12.7	12.1	73.4	8.8	1.44	1,070
Average				11.6	11.0	70.4	7.6	15.5	1,060
Morton County.									
Joseph Miller	**7764**	**Brabant**	**Oct. 10**	**14.5**	**13.8**	**73.9**	**8.1**	**1.79**	**508**

NORTH DAKOTA—Continued.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Nelson County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
James Lawer	7683		Oct. 4	14.3	13.6	74.1	9.9	1.45	675
Ransom County.									
I. J. Oliver	7612	Klein Wanzlebener	Sept. 27	10.9	10.4	70.8	8.1	1.35	805
Do	7613	do	Sept. 27	12.6	12.0	73.7	9.9	1.35	825
Do	7614	Florimond Desprez	Sept. 27	9.4	8.9	67.6	7.5	1.26	820
Do	7615	do	Sept. 27	10.6	10.1	73.1	8.8	1.21	725
Average				10.9	10.3	71.3	8.6	1.29	794
Sargent County.									
Henry Straub	8198	Vilmorin	Nov. 11	22.1	21.0		18.3	1.21	220
Do	8199	do	Nov. 11	21.6	20.5		18.4	1.17	215
Average				21.9	20.8		18.4	1.19	218
Stutsman County.									
J. J. Nierling	7792	Klein Wanzlebener	Oct. 11	13.2	12.5	77.6	10.5	1.26	570
Traill County.									
G. von Steinwehr	7600		Sept. 24	10.5	10.0	69.1	8.1	1.30	1,022
Do	7601		Sept. 24	10.3	9.9	70.1	8.1	1.39	796
P. Herbrandson	7926	Klein Wanzlebener	Oct. 20	13.8	13.1	78.4	12.3	1.12	1,263
Bure Bureson	7953	do	Oct. 23	20.6	19.6	84.1	17.0	1.21	397
Wm. Carson	7957	do	Oct. 23	16.7	15.9	73.6	8.8	1.81	288
N. F. Griswold	7958	do	Oct. 23	18.6	17.7	79.1	12.2	1.51	490
C. Cranston	8210		Nov. 14	17.8	16.9	82.4	12.5	1.43	650
Average				15.5	14.7	76.7	11.3	1.91	701

OHIO.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Butler County.									
Jno. W. McClellan	7645		Oct. 1	9.7	9.2	76.4	9.8	0.99	1,017
Erie County.									
B. J. Messig	7797		Oct. 11	9.3	8.8	71.5	8.1	1.15	305
Hamilton County.									
Henry L. Law	8461		Dec. 9	13.1	12.4	80.9	9.4	1.39	458
Sandusky County.									
C. W. Storer	8075	Klein Wanzlebener	Oct. 30	12.2	11.6	82.4	10.9	1.12	570
B. B. Overmyer	8408	Simon Legrand	Nov. 24	14.2	13.5	77.2	11.3	1.26	1,210
Do	8409	Klein Wanzlebener	Nov. 24	12.3	11.7	71.1	8.9	1.39	1,025
Average				12.9	12.3	76.9	10.3	1.26	935
Trumbull County.									
D. H. Wilder	7894	Vilmorin	Oct. 16	10.1	9.6	69.6	10.1	.99	801
Do	7895	Lane's Improved	Oct. 16	8.0	7.6	77.6	8.9	.90	1,113
Do	7896	do	Oct. 16	11.1	10.6	88.8	13.7	.81	485
Do	7897	Vilmorin	Oct. 16	9.0	8.6	76.9	8.3	1.08	1,273
Do	8280		Nov. 19	9.1	8.7	70.0	7.2	1.26	507
Do	8281		Nov. 19	11.9	11.3	81.0	12.0	.99	1,010
Do	8282		Nov. 19	11.6	11.0	81.1	14.3	.81	371
Average				10.1	9.6	77.9	10.6	9.3	808
Van Wert County.									
Marion Davidson	7889	Silesian	Oct. 16	5.7	5.4		3.4	1.66	320
Do	7890	do	Oct. 16	7.4	7.0	67.3	5.1	1.44	420
Average				6.6	6.2	67.3	4.2	1.55	370

OREGON.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Jackson County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
F. X. Musty	8428		Nov. 28	15.3	14.5	72.2	9.1	.68	610
Do	8429		Nov. 28	16.4	15.6	74.5	17.3	.95	510
Average				15.9	15.1	73.4	14.2	.82	560

PENNSYLVANIA.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Dauphin County.									
E. H. Leib	8285	Green Top	Nov. 19	8.8	8.4	74.6	7.0	1.26	1,014
Do	8286	Red Top	Nov. 19	8.9	8.4	78.8	9.0	.99	1,404
Average				8.9	8.4	76.7	8.0	1.13	1,209
Lancaster County.									
F. M. Weaver	7363	Klein Wanzlebener	Sept. 18	6.8	6.5	63.5	6.6	1.03	1,067
Do	7364	Lemaire	Sept. 18	6.3	6.0	82.2	5.6	1.12	362
Do	7365	Florimond Desprez	Sept. 18	10.3	9.8	78.0	12.0	.86	380
L. Wingenrath	7636	Klein Wanzlebener	Sept. 29	8.6	8.2	74.1	8.7	.99	537
Do	7637	Florimond Desprez	Sept. 29	9.8	9.3	73.7	9.5	1.03	560
Frank Stauffer	7749	Dippe's Vilmorin	Oct. 9	6.9	6.6	65.1	8.4	.82	445
Do	7750		Oct. 9	6.6	6.3		7.0	.94	610
Average				9.3	7.5	72.8	8.3	.97	566
Philadelphia County.									
N. Bart	8411	White Sugar	Nov. 24	10.9	10.4	75.2	9.0	1.21	1,225

SOUTH DAKOTA.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Brookings County.									
South Dakota Agricultural Experiment Station.	8116	Bulteau Desprez Richest.	Nov. 3	15.7	14.9	84.0	14.5	1.08	570
Do	8117	Dippe's Vilmorin	Nov. 3	15.9	15.1	84.1	18.5	.87	390
Do	8118	Oxnard Factory	Nov. 3	17.8	16.9	91.3	20.7	.86	328
Do	8119	Pajarro Valley, Cal	Nov. 3	14.4	13.8	76.6	13.3	1.00	418
Do	8120	Florimond Desprez	Nov. 3	13.0	12.4	85.0	7.8	1.67	585
Do	8121	Klein Wanzlebener	Nov. 3	15.2	14.4	86.4		Lost.	556
Do	8122	Simon Legrand White Improved.	Nov. 3	14.2	13.5	87.1		Lost.	454
Average				15.2	14.4	84.9	14.9	1.10	472
Brown County.									
Andrew Ballweg	8135	Klein Wanzlebener	Dec. 1	17.2	16.3	80.4	14.7	1.17	295
Davidson County.									
Salem Bruner	7873		Oct. 15	10.7	10.2	66.0	5.9	1.80	821
H. C. Preston	8082		Oct. 31	15.8	15.0	78.6	13.1	1.21	790
Average				13.3	12.6	72.3	9.5	1.51	806
Grant County.									
D. W. Diggs	8043		Oct. 28	11.6	11.0	73.0	7.4	1.57	856
Hyde County.									
Jno. C. Stoner	7661	Simon Legrand	Oct. 3	13.2	12.5	79.5	13.1	1.01	725
Do	7662	do	Oct. 3	13.7	13.0	78.7	11.1	1.23	795
Do	7961		Oct. 23	14.6	13.9	76.0	14.8	.99	445
Do	7962		Oct. 23	13.3	12.6	81.1	11.0	1.21	510
Average				13.7	13.0	78.8	12.5	1.11	619

SOUTH DAKOTA—Continued.

Name of grower.	Serial No.	Variety.	When received	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Kingsbury County.									
				P. ct.	*P. ct.*			*P. ct.*	*Gr'ms.*
W. A. Palmer	7603	Florimond-Desprez	Sept. 25	9.0	8.6	68.2	6.9	1.30	655
Do	7604	Simon Legrand	Sept. 25	13.0	12.4	73.4	9.0	1.44	450
Average				11.0	10.5	71.1	8.0	1.37	553
McCook County.									
Asael Larson	8049	White Improved	Oct. 29	11.0	10.5	76.4	10.9	1.03	385
Do	8050	do	Oct. 29	11.4	10.8	......	9.7	1.17	345
Average				11.2	10.6	76.4	10.3	1.10	365
Mead County.									
W. P. Flowers	8412		Nov. 24	14.7	14.0	72.1	8.6	1.71	780
Do	8413		Nov. 24	14.8	14.1	76.3	11.4	1.30	750
Average				14.8	14.1	74.2	10.0	1.51	765

TEXAS.

Scurry County.									
W. M. Sawyer	8024		Oct. 27	9.9	9.4	67.3	6.9	1.44	1,150
Do	8025		Oct. 27	11.0	10.5	71.4	8.2	1.35	995
Average				10.5	10.0	69.3	7.6	1.39	1,072

VIRGINIA.

Augusta County.									
O. K. Lapham	7756	Florimond Desprez Richest.	Oct. 9	10.0	9.5	78.7	13.9	.72	470
Do	7757	Klein Wanzlebener	Oct. 9	9.8	9.3	74.2	10.5	.93	576
Do	7758	Lane's Imperial	Oct. 9	8.6	8.2	75.4	9.9	.85	590
Do	7759	Lemaire	Oct. 9	8.9	8.5	71.8	9.9	.90	665
Do	7760	Vilmorin	Oct. 9	8.7	8.3	67.4	9.0	.97	465
Do	7761	do	Oct. 9	6.1	5.8	......	6.1	1.00	835
Wm. Goodwin	8154	Florimond-Desprez	Nov. 7	12.8	12.2	78.0	14.9	.86	228
Do	8155	Klein Wanzlebener	Nov. 7	11.1	10.6	69.1	14.4	.77	245
Do	8156	Lane's Improved Imperial.	Nov. 7	13.3	12.6	84.7	19.6	.68	260
Do	8157	Lemaire Richest	Nov. 7	15.3	14.5	83.2	17.8	.86	170
Do	8158	Vilmorin	Nov. 7	12.1	11.5	80.7	10.8	1.12	255
Do	8159	Vilmorin Improved Imperial.	Nov. 7	16.1	15.3	83.8	20.9	.77	265
J. J. Pennybacker	8402	Florimond Desprez	Nov. 22	12.6	12.0	......	7.6	.81	650
Do	8403	Klein Wanzlebener	Nov. 22	14.9	14.2	......	15.2	.63	350
Do	8404	Lane's Improved Imperial.	Nov. 22	13.3	12.6	....	16.4	.72	305
Do	8405	Lemaire Richest	Nov. 22	13.6	12.9	73.9	13.3	1.48	228
Do	8406	Dippe's Vilmorin	Nov. 22	14.3	13.6	74.9	10.9	1.48	378
Do	8407	Vilmorin Improved	Nov. 22	13.9	13.2	72.9	11.8	1.75	525
Average				12.0	11.4	76.3	12.9	.96	415
Loudoun County.									
J. B. McLaughlin	7995		Oct. 25	6.6	6.3	53.7	4.6	1.44	430
Do	7996		Oct. 25	4.8	4.6	.....	3.3	1.44	530
Average				5.7	5.4	53.7	4.0	1.44	480

WASHINGTON.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Lewis County.				*P. ct.*	*P. ct.*			*P. ct.*	*Gr'ms.*
W. J. Hoyne	8436		Dec. 2	16.0	15.2	84.2	14.2	1.12	450

WISCONSIN.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Calumet County.									
Gotfried Abitz	7808	Klein Wanzlebener	Oct. 13	9.9	9.4	78.0	8.3	1.20	1,300
Do	7809	Vilmorin Dippe's	Oct. 13	13.9	13.2	86.9	18.3	.76	315
Do	7869	Simon Legrand imported.	Oct. 14	13.9	13.2	90.2	17.0	.82	500
Average				12 6	11.9	81.9	14.5	.93	705
Kewaunee County.									
W. Seyk	7701	Dippe's Richest	Oct. 6	15.7	14.9	81.3	14.3	1.10	813
Do	7861	Imported from Bohemia.	Oct. 13	12.6	12.0	77.8	11.5	1.10	450
Average				14.2	13.5	79.6	12.9	1.10	632
Ozaukee County.									
Ernest Barkhausen	7943	Lemaire Richest	Oct. 22	11.5	10.9		13.4	.86	420
Do	7944	do	Oct. 22	13.2	12.5	81.5	14.7	.90	590
Average				12.4	11.7	81.5	14.1	.88	505
Vernon County.									
A. J. Rusk	8166		Nov. 7	12.5	11.9	82.3	12.1	1.03	800
Do	8167		Nov. 7	14.8	14.1	80.9	14.4	1.03	420
Do	8168		Nov. 7	16.2	15.4		18.0	.90	260
Average				14.5	13.8	81.6	14.9	.99	493

WYOMING.

Name of grower.	Serial No.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beet.
Carbon County.									
E. E. Bernard	7390	Vilmorin	Sept. 24	13.3	12.6	73.4	11.9	1.12	1,005
Do	7391	Pink Top	Sept. 24	12.5	11.9	72.2	11.6	1.08	1,420
Average				12.9	12.3	72.8	11.8	1.10	1,213
Crook County.									
H. C. Hensel	7784		Oct. 10	17.1	16.3		12.2	1.40	210
Laramie County.									
Henry S. Parker	8053		Oct. 29	16.7	15.8	84.8	12.4	1.35	690
Do	8054		Oct. 29	19.8	18.8		16.9	1.17	325
Average				18.3	17.3	84.8	14.7	1.26	508

Table showing beets having from 15 to 18 per cent. sucrose.

Name of grower.	Serial No.	State.	County.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
						Per ct.	*Per ct.*			*Per ct.*	*Gr.*
University of California	7619	California	Los Angeles	Vilmorin	Sept. 27	16.8	16.0	87.0	17.9	.94	352
Do	7616	...do	... do	Excelsior	Sept. 27	16.3	15.5	84.5	18.1	.90	407
C. S. Crandall	8035	Colorado	Larimer	Bulteau Desprez	Oct. 27	16.0	15.2	86.0	16.9	.95	395
Do	8036	...do	...do	...do	Oct. 27	15.5	14.7	84.7	16.3	.95	460
Do	8038	...do	...do	Klein Wanzlebener	Oct. 27	15.9	15.1	86.0	16.7	.95	805
Do	8039	...do	...do	Florimond Desprez	Oct. 27	16.2	15.4	84.4	18.0	.90	475
H. R. Rhone	8073	...do	Mesa	Not given	Oct. 30	15.2	14.4	86.4	13.0	1.17	453
Pueblo Board of Trade	8178	...do	Pueblo	...do	Nov. 8	15.5	14.7	82.9	13.3	1.17	650
Do	8179	...do	...do	...do	Nov. 8	15.9	15.1	84.1	14.0	1.12	580
Do	8180	...do	...do	...do	Nov. 8	15.4	14.6	83.7	14.3	1.08	485
C. W. Zepp	8055	...do	Yuma	Simon Legrand	Oct. 29	15.7	14.9	79.7	12.1	1.30	333
E. McAllister	8266	Illinois	Will	French Richest	Nov. 17	15.9	15.1	85.0	16.1	.99	600
F. H. Crumb	8216	... do	Warren	Florimond Desprez	Nov. 14	15.3	14.5	87.0	17.0	.90	610
J. A. Fellers	7775	Iowa	Black Hawk	Klein Wanzlebener	Oct. 10	15.9	15.1	81.5	18.1	.88	625
R. Hoff	7892	...do	Webster	Vilmorin	Oct. 16	15.9	15.1	95.2	18.3	.81	320
Do	8173	...do	do	...do	Nov. 8	17.6	16.7	91.1	25.9	.68	520
August Bohme	8021	...do	Carroll	...do	Oct. 27	15.5	14.7	85.2	14.4	1.08	213
G. B. Lord	7811	Kansas	Johnson	Vilmorin	Oct. 13	16.8	16.0	....	12.2	1.38	180
A. L. Bandy	8041	...do	Hamilton	Klein Wanzlebener	Oct. 28	15.7	14.9	82.2	13.8	1.12	720
O. Coyle	8433	...do	Barber	Not given	Dec. 1	17.8	16.9	84.8	17.3	1.03	140
Maryland Agricultural Experiment Station.	8057	Maryland	Prince George	Dippe's Vilmorin	Oct. 29	15.9	15.1	90.4	19.6	.81	383
Do	8200	...do	...do	...do	Nov. 12	15.4	14.6	....	26.1	.59	170
Do	8229	...do	...do	...do	Nov. 15	15.1	14.4	83.9	15.9	.95	385
Do	8249	...do	...do	...do	Nov. 15	15.4	14.6	82.8	24.4	.63	555
Do	8254	...do	...do	... do	Nov. 15	15.1	14.4	86.3	19.6	.77	245
Do	8443	...do	...do	Simon Legrand	Dec. 4	17.6	16.7	91.2	19.6	.90	213
Do	8444	...do	...do	Bulteau Desprez Richest	Dec. 4	17.8	16.9	84.8	19.8	.90	163
Do	8446	...do	... do	Klein Wanzlebener	Dec. 4	17.4	16.5	....	17.6	.99	125
W. H. Tenney & Co	8139	Massachusetts	Suffolk	Not given	Nov. 5	16.8	16.0	82.8	17.0	.99	350
J. R. Devenport	8284	Michigan	Muskegon	Russian	Nov. 19	16.4	15.6	89.1	17.2	.95	355
Dr. E. J. Howe	7696	...do	Ionia	Lemaire	Oct. 6	17.7	16.8	84.7	21.6	.82	387
J. S. Lawson	8047	...do	Macomb	Klein Wanzlebener	Oct. 29	16.8	16.0	89.8	28.5	.59	680
Do	8048	... do	do	Simon Legrand	Oct. 29	15.5	14.7	85.2	18.0	.86	705
Robert Glover	7606	Minnesota	Wilkin	Dutch	Sept. 24	15.4	14.6	80.6	15.6	.99	447
John Hunter	7659	...do	Anoka	Not given	Oct. 2	15.9	15.1	84.1	17.2	.93	680
Do	7707	...do	...do	...do	Oct. 6	16.3	15.5	82.3	18.3	.89	387
Leonhard Ziermann	7753	...do	Carver	Klein Wanzlebener	Oct. 9	15.8	15.0	81.0	15.2	1.04	503
E. A. Donnell	7788	...do	Goodhue	...do	Oct. 11	16.9	16.1	86.7	18.2	.93	447
W. H. Budd	7877	...do	Martin	.. do	Oct. 15	15.0	14.3	85.2	13.9	1.08	730
Peter Weinand	8151	...do	Hennepin	Not given	Nov. 6	16.5	15.7	79.3	15.3	1.08	847
W. H. Loverin	8171	...do	...do	Klein Wanzlebener	Nov. 8	15.6	14.8	87.2	15.8	.99	600
Simon Huntington	8007	...do	Cottonwood	Florimond Desprez	Oct. 27	15.6	14.8	72.9	10.8	1.44	675

Table showing beets having from 15 *to* 18 *per cent. surcrose*—Continued.

Name of grower.	Serial. No.	State.	County.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
						Per ct.	*Per ct.*			*Per ct.*	*Gr.*
James Taylor	8218	Minnesota	Murray	Not given	Nov. 14	17.1	16.3	84.7	17.3	.99	475
H. C. Bartlett	8103	...do	Travers	Simon Legrand	Nov. 3	17.5	16.6	73.3	14.6	1.21	575
H. W. Koch	8110	...do	Dakota	German sugar	Nov. 3	16.7	15.9	84.4	14.3	1.17	400
A. De Sutter	8127	...do	Lyon	Not given	Nov. 4	17.6	16.7	83.8	11.5	1.53	480
Hans Jagers	8062	...do	Becker	...do	Oct. 30	15.0	14.3	77.3	11.8	1.26	1,060
E. Jonason	7632	...do	Chisago	Florimond Desprez	Sept. 29	15.1	14.4	79.5	14.0	1.08	495
Gus. Olson	7982	Nebraska	Kearney	Klein Wanzlebener	Oct. 24	15.6	14.8	76.1	13.3	1.17	214
J. D. Evans	7656	...do	Hamilton	Not given	Oct. 2	15.1	14.4	....	13.1	1.15	210
A. H. Gale	8211	...do	Rock	Klein Wanzlebener	Nov. 14	15.2	14.4	83.1	12.1	1.26	400
J. B. Olson	8219	...do	Phelps	....	Nov. 14	16.0	15.2	75.8	10.5	1.53	290
M. O'Connor	7738	...do	Garfield	Vilmorin	Oct. 8	17.6	16.7	83.4	13.7	1.28	860
J. Gabriel	8128	...do	Saunders	Not given	Nov. 4	17.7	16.8	....	17.2	1.03	305
Do	8129	...do	...do	...do	Nov. 4	15.3	14.5	83.2	14.9	1.03	370
C. H. Purinton	7915	...do	Perkins	Klein Wanzlebener	Oct. 18	16.5	15.7	79.3	12.7	1.30	955
H. S. Morton	7640	...do	Knox	Not given	Sept. 29	15.3	14.5	81.4	13.1	1.17	595
Henry Smith	8417	...do	York	...do	Nov. 24	16.4	15.6	78.5	11.1	1.48	445
Do	8418	...do	...do	...do	Nov. 24	15.4	14.6	....	9.5	1.62	210
J. B. Martin	8010	...do	Colfax	Vilmorin	Oct. 27	15.4	14.6	81.9	14.3	1.08	523
Hans Stodt	7891	...do	Hall	Not given	Oct. 16	16.4	15.6	90.6	13.5	1.21	448
Fred. Suehlsen	7893	...do	...do	German white	Oct. 16	17.5	16.6	87.1	17.7	.99	398
H. H. Taylor	8045	...do	Hitchcock	Lemaire	Oct. 28	17.7	16.8	76.3	11.3	1.57	413
Do	8046	...do	...do	Desprez	Oct. 28	17.5	16.6	76.1	11.4	1.53	350
H. H. Saunders	7865	...do	Holt	Not given	Oct. 14	16.1	15.3	79.9	11.3	1.43	1,300
W. B. Lower	8002	...do	do	Imported white	Oct. 25	15.1	14.4	81.6	14.7	1.03	670
C. C. Ward	8453	...do	Thayer	Klein Wanzlebeuer	Dec. 6	16.9	16.1	77.9	12.2	1.39	335
Do	8455	...do	...do	Desprez	Dec. 6	17.1	16.2	83.2	13.6	1.26	292
Do	8458	...do	...do	Klein Wanzlebener	Dec. 6	15.9	15.1	76.4	9.5	1.62	500
T. E. Tackley	7938	...do	Pawnee	Florimond Desprez	Oct. 21	15.6	14.8	83.4	14.5	1.08	432
C. A. Ready	7817	...do	Hayes	Not given	Oct. 13	17.3	16.4	79.7	12.5	1.39	590
G. L. Sherman	7860	...do	Frontier	Desprez	Oct. 25	17.1	16.3	85.9	16.4	1.04	490
W. F. Sherman	7993	...do	...do	Vilmorin improved	Oct. 25	15.7	14.9	81.3	12.1	1.30	350
A. Richardson	8085	...do	Sheridan	Not given	Oct. 31	15.8	15.0	....	10.6	1.53	340
C. Osterman	8124	...do	Dodge	....	Nov. 4	16.3	15.5	83.2	15.8	1.03	450
R. P. Gregg	7975	...do	Dawes	Klein Wanzlebener	Oct. 24	16.2	15.4	72.7	8.4	1.93	290
P. W. Tracy	7801	...do	Box Butte	...do	Oct. 11	15.0	14.3	68.5	10.0	1.50	407
F. H. Trowbridge	7366	...do	Antelope	Not given	Sept. 22	16.1	15.3	82.1	16.9	.95	241
Do	7367	...do	...do	...do	Sept. 22	15.9	15.0	81.5	16.7	.95	226
Do	7368	...do	...do	...do	Sept. 22	16.6	15.8	88.8	16.1	1.03	176
C. A. Hathaway	7675	...do	...do	Klein Wanzlebener	Oct. 4	16.0	15.3	....	13.6	1.18	265
W. H. Cormeny	7998	...do	...do	Florimond Desprez	Oct. 25	16.5	15.7	86.4	16.7	.99	380
E. Adams	8109	...do	...do	Vilmorin	Nov. 3	16.7	15.9	80.7	10.0	1.67	400
J. Whiter	8000	...do	Lincoln	...do	Oct. 25	15.8	15.0	86.8	16.4	.90	930
A. D. Lemly	8262	New York	Genesee	Lane's or French	Nov. 17	15.0	14.3	83.3	18.5	.81	1,210

Wm. Carson	7957	North Dakota	Traill	Klein Wanzlebener	Oct. 23	16.7	15.9	73.6	8.8	1.81	288
C. Cranston	8210	...do	...do	Not given	Nov. 14	17.8	16.9	82.4	12.5	1.43	650
G. N. Smith	8425	...do	Cass	Klein Wanzlebener	Nov. 15	16.2	15.4	79.0	11.7	1.39	760
Do	8426	...do	...do	Dippe's Vilmorin	Nov. 15	17.1	16.3	86.8	14.1	1.21	690
F. X. Musty	8428	Oregon	Jackson	Not given	Nov. 28	15.3	14.5	72.2	9.1	.68	610
Do	8429	...do	...do	...do	Nov. 28	16.4	15.6	74.5	17.3	.95	510
H. C. Preston	8082	South Dakota	Davidson	...do	Oct. 31	15.8	15.0	78.6	13.1	1.21	790
South Dakota Agricultural Experimental Station.	8116	...do	Brooking	Bulteau Desprez Richest	Nov. 3	15.7	14.9	84.0	14.5	1.08	570
Do	8117	...do	...do	Dippe's Vilmorin	Nov. 3	15.9	15.1	84.1	18.5	.87	390
Do	8118	...do	...do	Oxnard Factory	Nov. 3	17.8	16.9	91.3	20.7	.86	328
Do	8121	...do	...do	Klein Wanzlebener	Nov. 3	15.2	14.4	86.4	......	......	556
A. Ballweg	8435	...do	Brown	...do	Dec. 1	17.2	16.3	80.4	14.7	1.17	295
Wm. Goodwin	8157	Virginia	Augusta	Lemaire Richest	Nov. 7	15.3	14.5	83.2	17.8	.86	170
Do	8159	...do	...do	Vilmorin Improved	Nov. 7	16.1	15.3	83.8	20.9	.77	265
W. J. Hoyne	8436	Washington	Louise	Not given	Dec. 2	16.0	15.2	84.2	14.2	1.12	450
W. Seyk	7701	Wisconsin	Kewaunee	Dippe's Richest	Oct. 6	15.7	14.9	81.3	14.3	1.10	813
A. J. Rusk	8168	...do	Vernon	Not given	Nov. 7	16.2	15.4	......	18.0	.90	260
H. C. Hensel	7784	Wyoming	Crook	...do	Oct. 10	17.1	16.3	......	12.2	1.40	210
Henry S. Parker	8053	...do	Laramie	...do	Oct. 29	16.7	15.8	84.8	12.4	1.35	690

Table showing beets having 18 per cent. sucrose and over.

C. W. Zepp	8113	Colorado	Yuma	Klein Wanzlebener	Nov. 3	19.2	18.2	......	13.3	1.44	93
John Betts	8273	Indiana	Clinton	Not given	Nov. 17	19.1	18.2	78.9	14.7	1.30	410
R. Hoff	8172	Iowa	Webster	Vilmorin	Nov. 8	18.1	17.2	87.5	23.5	.77	220
Maryland Agricultural Experimental Station.	8438	Maryland	Prince Georges	...do	Dec. 4	22.0	21.0	......	34.9	.63	90
Do	8439	...do	...do	Bulteau Desprez	Dec. 4	18.4	17.5	......	23.9	.77	40
Do	8440	...do	...do	Florimond Desprez	Dec. 4	20.0	19.0	......	27.8	.72	58
Do	8441	...do	...do	Klein Wanzlebener	Dec. 4	19.8	18.8	......	22.0	.90	63
Do	8442	...do	...do	Vilmorin	Dec. 4	19.9	18.9	94.8	20.9	.95	375
W. H. Maxwell	8208	Minnesota	Murray	Klein Wanzlebener	Nov. 14	18.6	17.7	84.3	19.6	.95	279
James Taylor	8209	...do	...do	...do	Nov. 14	18.7	17.8	82.4	18.2	1.03	280
H. C. Bartlet	8102	...do	Travers	German Legrand	Nov. 3	18.3	17.4	79.2	14.1	1.30	840
J. H. Knowles	8268	Nebraska	Lincoln	Klein Wanzlebener	Nov. 17	19.8	18.8	82.8	14.7	1.35	515
F. H. Trowbridge	7369	...do	Antelope	Not given	Sept. 22	18.8	17.9	81.8	18.3	1.03	119
T. A. Fleming	8084	...do	Sheridan	...do	Oct. 31	19.6	18.6	78.7	12.5	1.57	500
E. H. Benedict	7710	...do	Holt	Klein Wanzlebener	Oct. 6	19.8	18.8	......	12.7	1.56	205
Do	7711	...do	...do	...do	Oct. 6	18.1	17.2	......	10.7	1.69	187
Edgar Bruner	8197	...do	...do	Not given	Nov. 11	20.4	19.4	73.9	10.8	1.89	220
C. E. Ward	8454	...do	Thayer	Lemaire	Dec. 6	18.3	17.4	82.1	13.6	1.35	385
Do	8456	...do	...do	Klein Wanzlebener	Dec. 6	18.2	17.3	84.7	16.9	1.08	323
William Gauser	8138	...do	Scott Bluff	Not given	Nov. 5	23.9	22.7	83.3	15.6	1.50	333
C. D. Emerson	8447	...do	Kearney	Lemaire Richest	Dec. 4	22.8	21.7	......	13.7	1.66	155
Do	8448	...do	...do	Klein Wanzlebener	Dec. 4	25.5	24.2	......	14.6	1.75	303
G. W. Hultz	8028	...do	Deuel	...do	Oct. 27	19.8	18.8	......	12.2	1.62	248
Dan Neff	7973	...do	Perkins	...do	Oct. 24	18.0	17.1	90.5	15.4	1.17	630

Table showing beets having 18 *per cent. sucrose and over*—Continued.

Name of grower.	Serial No.	State.	County.	Variety.	When received.	Sucrose in juice.	Sucrose in beet.	Purity.	Saline coefficient.	Ash.	Average weight of beets.
						Per ct.	*Per ct.*			*Per ct.*	*Gr.*
Bure Bureson	7953	North Dakota	Traill	Klein Wanzlebener	Oct. 23	20.6	19.6	84.1	17.0	1.21	397
N. V Griswold	7958	....do	....do	....do	Oct. 23	18.6	17.7	79.1	12.2	1.51	490
Henry Straub	8198	....do	Sargent	Vilmorin	Nov. 11	22.1	21.0		18.3	1.21	220
Do	8199	....do	....do	....do	Nov. 11	21.6	20.5		18.4	1.17	215
Henry S. Parker	8054	Wyoming	Laramie	Not given	Oct. 29	19.8	18.8		16.9	1.17	325

Table showing yield of beets of different weights per acre, etc.

Weight of beet.	Weight of beet.	Yield per acre.	Available sugar per acre in pounds.														
			8 per cent.	9 per cent.	10 per cent.	11 per cent.	12 per cent.	13 per cent.	14 per cent.	15 per cent.	16 per cent.	17 per cent.	18 per cent.	19 per cent.	20 per cent.	21 per cent.	22 per cent.
Grammes.	*Ounces.*	*Tons.*															
100	3.53	4.40	563	634	704	774	845	915	986	1,056	1,126	1,197	1,267	1,338	1,408	1,478	1,549
200	7.06	8.80	1,126	1,267	1,408	1,549	1,690	1,830	1,971	2,112	2,253	2,394	2,534	2,675	2,816	2,957	3,098
300	10.59	13.20	1,680	1,901	2,112	2,323	2,534	2,746	2,957	3,168	3,379	3,590	3,802	4,013	4,224	4,435	4,646
400	14.12	17.60	2,253	2,534	2,816	3,098	3,379	3,661	3,942	4,224	4,506	4,787	5,069	5,350	5,632	5,914	
500	17.65	22.00	2,816	3,168	3,520	3,872	4,224	4,576	4,928	5,280	5,632	5,984	6,336	5,688	7,040		
600	21.18	26.40	3,379	3,802	4,224	4,646	5,069	5,491	5,914	6,336	6,758	7,181	7,603	8.026			
700	24.71	30.80	3,942	4,435	4,928	5,421	5,914	6,406	6,899	7,392	7,885	8,378	8,870				
800	28.24	35.20	4,506	5,069	5,632	6,195	6,758	7,322	7,885	8,448	9,011	9,574					
900	31.77	39.60	5,069	5,702	6,336	6,970	7,603	8,237	8,870	9,504	10,138						
1,000	35.30	44.00	5,632	6,336	7,040	7,744	8,448	9,152	9,856	10,560							
1,100	38.83	48.40	6,195	6,970	7,744	8,518	9,293	10,067	10,842								
1,200	42.36	52.80	6,758	7,603	8,448	9,193	10,138	10,982									
1,300	45.89	57.20	7,322	8,237	9,152	10,067	10,982										
1,400	49.42	61.60	7,885	8,870	9,856	10,842											
1,500	52.95	66.00	8,448	9,504	10,560												

EXPLANATORY NOTE.—To get the yield of beets per acre of any given weight, follow the line of the given weight to the right to column of yield in tons. The columns of figures under the several per cents of sugar in the beets give roughly the quantity of sugar which would be obtained per acre, with the yield and richness indicated. To get the total sugar per acre, multiply the per cent in each case by 2,000, and by the yield per acre in tons. Thus the total sugar produced per acre for a beet having 14 per cent of sugar and having a weight of 600 grammes would be $14 \times 2,000 \times 26.4 = 7,392$ pounds.

The yield in tons is based on the supposition that 40,000 plants grow upon each acre. This rule could be applied to beets up to 700 grammes in weight, but above that the number of beets per acre would not reach so high a figure. The yields, therefore, for beets over 100 grammes are exaggerated. It was thought best, however, to complete the table on the one plan.

The available sugar is given approximately at 80 per cent of the total sugar. The actual amount of sugar obtained in any instance might vary largely from the number, but 80 per cent may be taken as a fair average yield.

In the preceding summary of the beets sent from Nebraska are not included those which were examined at the Grand Island Sugar Factory under the direction of the Chemical Division, but only those which were sent directly to the Department at Washington for examination. In addition to these two sets of analyses large numbers of samples were examined in the laboratory of the Agricultural Experiment Station at Lincoln.

The following table contains the results of the analyses made by Mr. H. E. L. Horton at Grand Island, Nebr., on samples of beets delivered for manufacture:

Name.	Post-office address.	No. of samples.	Average weight of beet.	Total solids indicated by Brix spindle.	Sucrose in juice.	Purity coefficient.
			Grams.	*Pr. ct.*	*Pr. ct.*	
Allen, E. M	Schuyler, Colfax Co	2	285	20.0	16.8	84.0
Anderson, E. C	Dannebrog, Howard Co	1	204	20.3	17.1	84.2
Anton, Conrad	Palmer, Merrick Co	3	130	18.6	16.0	86.7
Appel, Christ	Dannebrog, Howard Co	1	189	20.1	17.9	89.1
Asterhold, W	Grand Island	9	251	20.2	16.5	83.2
Aye, Peter	....do	4	204	19.7	16.4	82.8
Do	....do	2	273	20.6	17.5	84.9
Barnard, Alfred	Alda, Hall Co	1	419	20.5	16.5	80.5
Barick, William	....do	3	131	20.0	16.6	83.0
Barth, Fritz	Grand Island	12	173	19.3	16.3	84.0
Baumann, Eno	....do	3	221	20.2	16.9	83.8
Baumann, Remmet	....do	2	209	19.5	16.5	82.5
Backkova, Fr	St. Michael, Buffalo Co	1	......	19.1	16.3	85.3
Bame, E	Schuyler, Colfax Co	1	242	19.6	16.7	85.2
Beekmann, A	Grand Island	1	351	19.0	15.2	80.0
Becker, Fritz	....do	1	232	23.5	20.1	85.5
Do	....do	1	124	19.9	16.7	83.9
Berry, George	Seward, Seward Co	2	280	19.7	16.7	84.8
Bern, Friedrich	Grand Island	9	255	19.5	16.3	83.0
Bemis, A. H	Seward, Seward Co	3	334	18.1	14.9	82.4
Beberniss, John	Grand Island	12	294	19.3	16.0	82.6
Bell, D. E	Chapman, Merrick Co	3	231	20.0	16.7	83.4
Beberniss, Fritz	Grand Island	15	212	20.5	17.3	84.4
Belville, Joseph	Chapman, Merrick Co	7	203	18.6	15.8	85.0
Beyer, Karl	Grand Island	10	273	18.7	15.9	84.2
Blaine, H. M	....do	1	209	19.8	17.1	86.9
Blunk, Ad		15	218	20.1	17.4	86.9
Bowman, S. S	Wood River, Hall Co	1	188	21.0	16.4	78.1
Boose, Johann	Grand Island	12	188	18.5	15.6	82.7
Boekholm, Carl	Cairo, Hall Co	7	182	19.6	16.3	81.4
Boersen, Henry	Grand Island	12	......	......	......	......
Bruckner, R. J	Nantasket, Buffalo Co	1	267	20.5	17.7	86.3
Brannan, F	Central City, Merrick Co	1	217	22.1	17.9	81.6
Brachmann, D	St. Libory, Howard Co	1	275	18.2	14.4	79.8
Brandt, David	Abbott, Hall Co	4	245	20.4	17.4	87.0
Braasch, Adolph	Grand Island	8	233	19.2	15.6	81.2
Bruckmann, E	....do	5	302	18.9	15.5	82.8
Buckow, Fritz	....do	1	542	19.5	16.5	84.6
Bullock, J. A	Alda, Hall Co	1	178	18.4	16.1	87.4
Burman, Oscar	Boelus, Howard Co	1	215	21.2	17.9	84.4
Buhmann, Hury	St. Libory, Howard Co	1	......	19.3	16.7	......
Buell, H. G	Chapman, Merrick Co	5	199	18.8	15.5	82.4
Buchholz, Fr	Grand Island	9	178	18.2	15.3	81.6
Buhlke, John	....do	5	287	19.1	16.0	83.8
Busing, Ernst	....do	2	229	18.9	15.8	85.6
Case, C	Clarks, Merrick Co	1	334	20.0	15.5	77.5
Carr, Geo. W	St. Michael, Buffalo Co	1	160	18.2	15.1	82.9
Carter, Fr. M	St. Paul, Howard Co	1	......	22.7	18.2	......
Carlsen, N. T	Dannebrog, Howard Co	1	......	......	16.6	......
Campbell, J. M	Cairo, Hall Co	2	240	20.0	15.9	79.2
Clad, Jno. E. R	Chapman, Merrick Co	1	322	22.8	18.8	82.5
Class, Frank	Ravenna, Buffalo Co	1	160	20.5	16.4	80.0
Clarks Sugar and Beet Co	Clarks, Merrick Co	1	187	23.2	19.1	82.3
Claussen, Turgen	Grand Island	7	282	20.6	17.3	84.0
Craniviseur, John	Columbus, Platte Co	1	270	21.5	18.4	85.6
Craig, C., E. and A. R		8	279	18.8	15.5	82.4
Cushman, I. B	Chapman, Merrick Co	13	269	18.8	15.6	83.0
Cunningham, M. J	Wood River, Hall Co	6	230	19.3	16.4	84.8
Daniels, A. P	Clarks, Merrick Co	1	207	19.8	16.6	78.2

Name.	Post-office address.	No. of samples.	Average weight of beet.	Total solids indicated by Brix spindle.	Sucrose in juice.	Purity coefficient.
			Grams.	*Pr. ct.*	*Pr. ct.*	
Dankert, Hans	Grand Island	1	335	18.4	15.4	83.7
Damman, Claus	...do	1	217	19.7	17.3	87.8
David, M. F	Broken Bow, Custer Co	1	339	22.1	17.6	79.6
Daberkon, Karl	Grand Island	4	173	18.8	15.9	86.0
De Moss, W. T	Shelton, Hall Co	1	164	23.4	21.0	89.3
Detlef, S	Grand Island	8	138	20.2	16.7	81.9
Detlef, Cristen	...do	4	265	18.9	15.5	81 9
Deichmann, Carl	...do	22	306	19.4	16.4	84.5
Diehl, E	Cairo, Hall Co	1	146	20.5	16.8	81.9
Diekmann, Peter	St. Libory, Howard Co	4	277	19.4	16.6	86.7
Dorgensen, Saren	Dannebrog, Howard Co	1	228	19.5	16.2	83.1
Dohms, Carl	Grand Island	9	178	18.7	15.4	82.4
Dobrinske, Aug	... do	3	332	20.6	17.5	84.6
Drake, Leroy	Shelton, Buffalo Co	1	......	19.3	17.0	88.1
Dutton, Jas. H	Chapman, Merrick Co	2	198	20.9	17.6	83.8
Dünermann, C. H	Grand Island	18	251	20.4	17.3	85.1
Dunermann, G	...do	12	197	19.3	15.8	84.0
Eickhoff, H	...do	4	219	19.7	16.1	82.7
Elstermeur, Carl	... do	1	173	22.3	18.2	81.7
Ennis, Martin	...do	1	271	17.7	15.0	84.7
Enders, Casper	St. Libory, Howard Co	2	......	20.3	16.6	81.6
Erozim, Chas	Ravenna, Buffalo Co	1	......	23.0	18.5	80.5
Erickson, Jacob	Nysted, Howard Co	1	......	18.2	14.6	80.2
Erickson, Nels	...do	1	390	20.7	17.4	84.1
Ernstmeyer, F	Grand Island	5	224	19.6	15.6	80.1
Erozim, Anton	Ravenna, Buffalo Co	2	......	19.6	15.9	85.4
Ewoldt, Cay	Grand Island	1	409	15.3	11.9	77.7
Ewold, B	...do	11	259	17.3	14.1	81.5
Ewold, Claus	...do	2	443	18.2	14.5	80.0
Ewing, John	Wood River, Hall Co	4	180	19.0	16.5	83.4
Falldorf, Fred	Grand Island	11	206	18.6	15 5	82.1
Falles, W. H	...do	2	125	20.7	17.8	85.3
Fay, Peter	St. Libory, Howard Co	1	212	18.3	15.4	84.1
Farnham, D. W	Central City, Merrick Co	1	98	19.9	16.7	83.9
Fisher, John	Ravenna, Buffalo Co	1	232	19.8	16.1	81.3
Fishburn, W. H	Grand Island	8	......	19.8	15.8	79.3
Fischer, Jul	...do	6	234	20.1	17.7	89.9
Flörke, Heinz	... do	7	275	19.7	16.4	83.5
Folson, James	...do	5	211	19.4	16.1	83.0
Foulk, Geo	St. Paul, Howard Co	......	......	......	......	......
Frauen, Jos	St. Libory, Howard Co	1	234	20.0	17.1	85.5
Frey, J. S	Boelus, Howard Co	1	193	20.0	16.7	83.5
Frauen, Paul	Lockwood, Merrick Co	10	331	19.1	16.1	83.7
Franz, Fred	Alda, Hall Co	3	......	20.0	17.0	87.6
Friend, John	Grand Island	4	191	19.9	16.8	84.5
Frank, Jacob	...do	11	271	20.0	16.6	84.0
Gallup, Henry A	Alda, Hall Co	5	131	19.0	15.7	82.6
Gatwerth, Erbs	Duncan, Platte Co	1	212	18.7	15.9	84.4
Gallup, Henry A	Alda, Hall Co	1	163	19.5	16.1	82.5
Gehrt, Peter	Nantasket, Buffalo Co	1	210	18.3	15.5	84.7
Gerard, A	Bellwood, Butler Co	1	270	21.5	18.4	85.6
Geisinger, Felix	Grand Island	10	263	19.6	15.3	81.6
Giese, Henry	...do	6	......	17.8	18.0	82.0
Glaggner, Paul	.. do	4	240	20.9	17.8	85.2
Gottschalk, Fritz	Fremont, Dodge Co	1	414	17.5	13.4	76.4
Goehring, Rich	Grand Island	14	218	19.5	16.9	85.1
Goehring, Richard	... do	3	151	19.6	16.2	87.3
Goetsche, Christ	...do	4	119	21.5	18.2	83.9
Gosda, Herman	...do	2	204	18.4	15.6	84.7
Grant, Jas	St. Libory, Howard Co	1	303	18.2	14.6	80.2
Grotzky, Claus	Merrick Co	5	179	18.5	15.3	82.1
Grozch, Julius	Grand Island, Hall Co	6	180	19.3	16.0	83.2
Grembe, Jacob	.. do	4	......	17.2	15.1	87.2
Grotzky, Claus		2	144	20.3	17.6	86.8
Grumpecht, Carl	Shelton, Buffalo Co	1	142	18.5	14.1	76.2
Gutzow, Henry	Grand Island	1	......	21.0	19.9	......
Grünther Bros	Ravenna, Buffalo Co	1	255	18.7	15.2	81.2
Haldemann, J. T	Alda, Hall Co	1	78	19.8	16.6	83.9
Hannibal, P. M	Dannebrog, Howard Co	1	211	19.2	16.3	84.9
Ham, Henry	Grand Island	1	236	16.8	12.6	75.0
Hansen, Peter	Dannebrog, Howard Co	1	221	17.1	11.8	69.0
Hamilton, T. M	Warner's Addition	5	194	17.9	14.5	81.0
Hand, John	Seward, Seward Co	2	294	18.9	15.5	81.6
Harris, T. R	Marquette, Hamilton Co	1	138	20.3	16.7	83.1
Ham, Moses	St. Michael, Buffalo Co	1	215	18.3	14.2	72.1
Hamilton, T. M	Grand Island	24	410	18.9	15.9	84.1
Hanssen, Gils	...do	11	257	19.9	16.7	84.1
Halling, Wm	Merrick Co	16	239	19.2	16.0	82.7
Hansen, Jens	Dannebrog, Howard Co	2	254	18.7	15.8	84.7

Name.	Post-office address.	No. of samples.	Average weight of beet.	Total solids indicated by Brix spindle.	Sucrose in juice.	Purity coefficient.
			Grams.	*Pr. ct.*	*Pr. ct.*	
Haun, Y. C	Grand Island	10	....	21.5	18.4	87.6
Hamlin, J. J	Seward, Seward Co	2	151	19.2	15.7	81.7
Hansjosten, Peter	Chapman, Merrick Co	6	278	19.4	16.2	83.5
Hansen, Jens	Boelus, Howard Co	5	285	20.3	16.9	83.2
Hansjosten, Jahn	Grand Island	21	245	19.4	15.6	81.9
Hasman, Ernst and Fritz	....do	25	241	19.2	16.4	84.6
Henrikson, M	Dannebrog, Howard Co	1	246	20.0	16.2	....
Henrikson, L. H	Boelus, Howard Co	1	343	18.8	15.5	82.4
Hermansen, Martin	Dannebrog, Howard Co	1	236	20.6	17.5	84.9
Hegeman, O. R	Buckley, Jefferson Co	1	135	20.9	18.1	86.6
Hensel, Wm	Shelton, Buffalo Co	1	232	21.0	17.7	84.3
Hume, Heim	Grand Island	8	178	18.7	11.7	78.6
Hessel, Joseph	....do	8	227	20.0	15.9	82.0
Hein, Claus	Fremont, Dodge Co	2	227	20.5	17.5	85.4
Hein, Mathias	Chapman, Merrick Co	2	192	22.4	18.9	84.3
Heinz, Nich	Pleasant Add., Hall Co	8	266	19.1	16.4	85.9
Helkrey, Jay	Norfolk, Madison Co	3	488	19.0	15.8	83.2
Hillis, Jno. & W	Doniphan, Hall Co	3	317	19.5	15.8	82.8
Horak, John	Sherman Co	1	292	20.0	16.3	81.5
Housewortb, More	Fremont, Dodge Co	1	324	20.1	17.2	85.6
Houten, J.D. van	Norman, Kearney Co	1	204	21.5	19.4	90.2
Hohman, Caspar	Grand Island	9	134	19.6	16.0	81.6
Honeywell, G. W	St. Paul, Howard Co	2	310	21.0	18.5	88.3
Hunter, C. H	Seward, Seward Co	1	130	20.6	17.4	84.5
Hund, G. & B	Cairo, Hall Co	3	260	19.5	15.6	82.1
Husch, Peter	Grand Island	9	212	19.7	16.8	85.3
Janssen, Peter	Rockville, Sherman Co	1	101	19.6	16.9	86.2
Jacob, Georg	St. Paul, Howard Co	2	396	19.2	15.5	80.0
Jensen, Christ	Dannebrog, Howard Co	1	324	16.8	14.2	84.5
Karp, Chas	St. Michael, Buffalo Co	1	143	20.6	17.3	83.9
Karstel, George	St. Libory, Howard Co	1	286	21.2	18.3	86.3
Kettler, A. B	....do	2	321	18.9	16.3	86.4
Kent, M	Grand Island	1	219	20.6	18.1	87.8
Keühn, H. F. W	Dannebrog, Howard Co	1	277	20.2	16.0	79.2
Ketteler, A. H	St. Libory, Howard Co	2	289	19.8	16.3	82.5
Kunyon, Ch	Boelus, Howard Co	1	270	20.8	17.2	82.7
Keinch, M. E	Cairo, Hall Co	1	211	20.0	17.1	80.5
Kingsley, O. H	Clarks, Merrick Co	3	164	20.7	16.3	83.2
Klase, Rob	Doniphan, Hall Co	1	354	16.1	14.1	....
Kleine, E	Grand Island	1	206	19.0	14.8	77.8
Klein, Ernst	....do	1	....	21.8	16.7	80.7
Klingenberg, Hans	Chapman, Merrick Co	2	339	18.5	15.5	83.7
Klunker, Fred	Shelton, Buffalo Co	2	360	19.7	15.9	79.6
Knipphals, Chr	Grand Island	8	221	19.7	15.8	82.3
Kosch, Vincent	Boelus, Howard Co	1	215	21.2	17.9	84.4
Kolar, Joseph	Ravenna, Buffalo Co	1	181	20.0	16.8	84.0
Kozel, Anton	Ravenna, Buffalo Co	2	373	21.2	17.5	82.5
Köhler, Oscar	Grand Island	11	240	20.2	17.6	87.1
Kroeger, Hans	....do	1	169	20.8	17.3	83.2
Kroeger, Rud	....do	4	219	20.4	17.2	82.7
Kruse, Henry		15	252	19.1	16.0	83.4
Kraemer, Peter	Merrick Co	25	276	18.4	15.0	81.4
Krekuke, Jul	Alda, Hall Co	4	277	19.9	16.6	85.8
Kroeger, Fred	Grand Island	9	286	19.2	15.7	81.8
Kroeger, Michael	....do	21	283	20.6	18.8	85.4
Kuhlman, W. M	....do	1	186	19.7	15.6	79.1
Kuhner, Karl	Philips, Hamilton Co	5	204	18.0	15.0	83.3
Kundsen, B	St. Libory, Howard Co	1	180	17.7	14.6	82.4
Kutschkan, Gus	Grand Island	3	151	21.0	17.5	83.4
Lamsen, John	Dannebrog, Howard Co	1	110	19.2	15.6	81.3
Lange, Henry		12	351	18.5	15.6	84.5
Lange, H	Grand Island	11	170	20.4	17.8	86.8
Lassen, Conrad	....do	5	290	17.5	14.3	83.9
Leppin, Wm	....do	12	168	19.5	16.2	83.6
Leppin, Christ	....do	11	161	22.8	18.6	82.9
Linden, John P	....do	5	277	17.2	14.0	81.1
Lilienthal, H	.. do	17	247	19.2	16.1	83.4
Linelstrom, M. J	Boelus, Howard Co	1	187	21.0	17.8	84.8
Lopmann, Wilhelm	Grand Island	11	175	20.3	16.5	81.2
Long, T. M	St. Michael, Buffalo Co	1	101	19.9	17.7	88.9
Lübs, Henry	Alda, Hall Co	2	261	21.5	18.3	84.9
Luth, Fred	Grand Island	5	....	20.1	16.1	83.4
Lübbe, Claus	.. do	19	234	19.5	16.5	85.4
Lyons, Miles	Wood River, Hall Co	1	261	21.0	16.9	156.7
Marshall, John	Columbus, Platt Co	1	237	18.7	15.6	83.4
Martin, David	Central City, Merrick Co	1	274	20.1	16.7	83.1
Marshal, Thos. F	Columbus, Platt Co	1	207	18.2	14.8	81.3
Madson, P. Ch	Dannebrog, Howard Co	1	388	19.7	16.4	83.2
Marshal, Jas	Columbus, Platt Co	1	269	19.5	16.1	82.6

Name.	Post-office address.	No. of samples.	Average weight of beet.	Total solids indicated by Brix spindle.	Sucrose in juice.	Purity coefficient.
			Grams.	*Pr. ct.*	*Pr. ct.*	
Martin, J. B	Schuyler, Colfax Co	2	374	20.7	16.7	80.5
Martin, J. L	Chapman, Merrick Co	3	360	18.8	15.7	83.3
McKee and H. B. Wray	Alda, Hall Co	5	200	19.8	16.6	82.5
McDaniel, W. R	Cairo, Hall Co	1	151	20.5	18.5	90.2
McLoin, R	Fremont, Dodge Co	1	271	18.8	15.7	83.4
McIntosh, W. G	Rockville, Sherman Co	1	117	20.2	16.8	83.1
Mettembrick, C	Grand Island	13	211	19.0	15.9	83.3
Melson, L	Dannebrog, Howard Co	1	138	20.2	16.7	82.7
Mildenskein, N	Grand Island	6	195	18.8	15.5	82.2
Millard, C. E	O'Neill, Holt Co	2	278	20.3	16.3	81.6
Mitchell, Robert	Grand Island	13	238	18.4	15.0	82.1
Mohr, John	do	4	313	19.8	16.9	84.4
Morse, Marenas	Clarks, Merrick Co	4	270	20.4	16.7	82.3
Moody, J. L	Scotia, Greeley Co	2	274	18.8	15.6	82.7
Mohr, Peter	Grand Island	11	285	19.1	16.2	84.5
Moore, P. C	Central City, Merrick Co	1	407	20.0	16.0	80.0
Morris, C. H	Chapman, Merrick Co	1	160	23.5	18.2	....
Morey, Gorden	Cairo, Hall Co	......	231	20.5	17.5	85.4
Müeller, Ludwig	Chapman, Merrick Co	4	193	17.9	14.8	82.5
Muhl, Peter	do	2	209	22.1	18.5	83.9
McMullen, R	Grand Island	11	265	18.6	15.4	83.2
Myers, John	Shelton, Hall Co	1	272	23.7	20.2	85.2
Naffke, Carl	Grand Island	15	321	18.6	15.6	83.3
Navy, Wenzel	Ravenna, Buffalo Co	2	249	21.7	17.8	82.3
Neubert, Johann	Grand Island	13	254	18.8	15.3	81.5
Neubert, John	do	3	164	20.4	17.1	85.3
Nerills, M. T	Wood River, Hall Co	1	273	21.4	17.9	83.6
Nelson, N	Dannebrog, Howard Co	1	264	19.8	17.0	85.8
Nieturger, Christian	Grand Island	4	246	21.6	18.7	86.4
Nietfeld, Wm	do	7	307	19.2	16.1	82.9
Nissen, Chr	do	4	192	20.0	17.0	81.2
Nietfeld, Henry	do	2	203	21.0	17.4	82.8
Nichols, H. W	St. Paul, Howard Co	1	....	21.8	18.7	85.8
Nietfeld, Fritz	Grand Island	1	161	19.7	16.6	84.3
Noack, Ernst	Shelton, Buffalo Co	2	111	21.2	17.6	83.0
Norris, C. E	Ravenna, Buffalo Co	1	283	20.1	16.7	83.0
Obermeyer, Henry	Grand Island	11	196	18.8	15.4	82.2
Ohlmann, Fred	Shelton, Buffalo Co	1	282	23.4	21.3	82.0
Oltmann, John	Grand Island	9	257	20.9	17.3	82.9
Olsen, Fred	Nysted, Howard Co.	6	247	19.9	16.3	82.6
Onist, J. D	Shelton, Buffalo Co	1	327	23.2	19.2	82.7
Orndorff, Peter	Alda, Hall Co	1	189	20.2	16.2	....
Pahl, Hans	Grand Island, Hall Co	3	208	20.2	17.4	85.8
Paustian, G	do	12	284	20.1	16.5	82.0
Peters, C. T	St. Libory, Howard Co	2	211	19.8	16.9	85.2
Petzald, Louis	Grand Island, Hall Co	4	343	20.4	17.1	83.6
Peters, C. T	St. Libory, Howard Co	3	290	20.3	16.8	82.6
Peterson, W. C	Fremont, Dodge Co	1	412	17.7	14.7	79.6
Peterson, H. P	Dannebrog, Howard Co	1	189	19.2	15.5	....
Pitrek, Chas	Ravenna, Buffalo Co	2	173	21.2	17.4	83.1
Piefer, Henry	Grand Island, Hall Co	6	174	20.2	16.9	83.6
Pickett, James	Ravenna, Buffalo Co	1	145	18.4	14.4	78.8
Pitrick, John	Ravenna, Buffalo Co	1	170	20.1	15.7	....
Pohl, Jacob	Grand Island, Hall Co	4	333	20.5	17.3	84.0
Polenz, Julius	Ravenna, Buffalo Co	1	367	18.6	15.7	....
Prudy, H. G., and Launborn.	Lawrence, Nuckolls Co	6	265	20.8	17.6	84.6
Puchert, Chas	Ravenna, Buffalo Co	1	....	20.5	15.5	75.6
Roehler, H	Grand Island, Hall Co	5	115	22.3	18.3	82.5
Rapp, L. F	Broken Bow, Custer Co	1	403	19.4	15.1	77.8
Rasmussen, Jens	Dannebrog, Howard Co,	1	140	19.5	16.5	....
Raunert, Mathias	Grand Island, Hall Co	6	253	18.5	15.3	82.7
Rasmussen, H. C	Chapman, Merrick Co	5	234	17.7	14.4	81.3
Rein, Olsen	St. Libory, Howard Co	2	191	17.1	14.5	84.9
Reher, Chr	Grand Island, Hall Co	17	310	18.6	15.5	83.1
Remlo, Fred	do	4	139	18.6	15.4	82.1
Reher, John Fred	do	13	194	20.1	17.5	87.0
Reid, J. H., and Son	Columbus, Platte Co	1	243	20.2	17.4	86.1
Reyner, H	Broken Bow, Custer Co	1	236	23.5	19.2	81.7
Richardson, D	Alda, Hall Co	3	217	19.5	16.1	84.4
Ritterbush, H	Grand Island, Hall Co	2	262	19.9	16.5	83.1
Rizoe, A. J	do	3	114	20.4	17.5	85.7
Richter, Aug	Doniphan, Hall Co	1	402	18.8	15.9	84.6
Rieff Henry	Grand Island, Hall Co	1	337	21.3	18.9	88.7
Rowe, D	Fremont, Dodge Co	2	419	18.4	14.6	79.2
Rosk, Frank	St. Libory, Howard Co	2	290	18.6	16.1	87.2
Rosenkalter, Carl	Grand Island, Hall Co	13	171	19.8	16.5	83.4
Rosswick, Henry	Cairo, Hall Co	2	205	18.7	14.9	80.0
Roby, Gustav	Grand Island, Hall Co	8	297	19.5	16.4	82.9

Name.	Post-office address.	No. of samples.	Average weight of beet.	Total solids indicated by Brix spindle.	Sucrose in juice.	Purity coefficient.
			Grams.	*Pr. ct.*	*Pr. ct.*	
Roby, Fred	Grand Island, Hall Co	17	220	19.4	16.2	88.2
Rohweder, Henry	do	1	183	18.8	14.6	......
Robling, Fr.	Kelsa, Howard Co	1	222	17.4	13.0	74.1
Ropke, Heirick	St. Libory, Howard Co	1	375	20.3	15.9	73.4
Russell, J. B.	Grand Island, Hall Co	4	218	19.8	16.7	84.6
Ruge, Hans	do	5	173	20.2	17.2	86.2
Ruttstson, Ch. J	Boelus, Howard Co	1	215	21.2	17.9	84.4
Russell, G. W	St. Paul, Howard Co	1	......	21.0	18.2	85.7
Salyards, David	Richland, Colfax Co	1	200	19.4	17.0	87.6
Schmidt, Ernst	Fremont, Dodge Co	1	402	17.4	15.0	84.3
Schroeder, Wm	Columbus, Platte Co	1	204	19.4	16.2	83.4
Schlund, Nat	St. Michael, Buffalo Co	1	126	18.1	15.1	83.4
Schaubdach, Chi	Alda, Hall Co	9	336	20.2	16.7	82.8
Schrnale, Carl	Grand Island, Hall Co	7	192	19.7	16.1	81.6
Schultz, John	do	12	208	17.9	14.8	83.3
Schleichardt, Fr	do	14	247	19.7	16.1	81.7
Schultz, Ludwig	do	13	286	21.1	18.2	85.9
Schroeder, Fritz	Alda, Hall Co	8	237	18.3	15.4	84.1
Schuldt, John	Schuyler, Colfax Co	2	317	18.9	14.9	78.6
Schuster, Heinrich	Phillips, Hamilton Co	3	242	18.9	15.7	83.0
Schinkel, John	Grand Island, Hall Co	4	225	18.3	14.1	77.4
Schmale, H	do	7	200	19.6	16.4	83.2
Schultz, Peter	Cairo, Hall Co	7	215	20.2	17.3	85.2
Schoenstein, Alb	Grand Island, Hall Co	2	166	18.5	15.3	82.6
Schimmer, Henry	do	14	255	18.8	15.7	83.1
Schipmann, H	do	4	196	20.9	18.2	88.0
Schultz, Ernst	do	5	358	19.7	17.1	86.5
Scherzbeig, C		7	336	20.1	16.4	81.5
Serei, John	Grand Island, Hall Co	9	197	20.7	15.9	77.5
Seehusen, John	Dannebrog, Howard Co	2	227	19.0	14.8	......
Senkbeil, Rud	Grand Island, Hall Co	8	246	18.4	15.2	63.0
Sears, C. H	Clarks, Merrick Co	2	158	21.3	18.3	85.8
Seibert, Reed	Grand Island, Hall Co	4	222	19.4	15.8	82.3
Seifert, David	Boelus, Howard Co	1	289	16.8	13.0	77.2
Shipman, H	Grand Island, Hall Co	2	270	17.4	13.2	75.6
Shoof, Henry	Oconel, Platte Co	2	197	19.8	16.5	82.9
Shoman, Wm	Clarks, Merrick Co	1	135	19.3	16.2	83.9
Silvers, Theo	Grand Island, Hall Co	4	......	19.1	15.4	......
Sigman, Walter	Cairo, Hall Co	1	192	18.3	15.4	......
Skoogard, C. T	Nysted, Howard Co	3	280	20.3	17.2	85.8
Smithwick, M	Grand Island, Hall Co	17	198	20.1	17.3	86.6
Smith, Alex	Seward, Seward Co	2	245	17.9	14.0	78.1
Smith, A. O	Central City, Merrick Co	2	312	20.4	16.9	83.0
Sondermeyer, Caspar	Grand Island, Hall Co	11	223	19.5	15.7	80.8
Sothman, Gus	Shelton, Buffalo Co	2	305	20.3	17.6	86.8
Sorensen, E. H	Dannebrog, Howard Co	1	232	20.5	16.3	79.5
Sothman, Claus	St. Michael, Buffalo Co	1	117	21.4	19.0	88.7
Spethman, Leopold	Grand Island, Hall Co	7	184	18.8	16.1	83.6
Spech, N. and McElhenny, D.	Cairo, Hall Co	1	354	20.4	16.5	......
Specht, Nat	St. Michael, Buffalo Co	1	......	15.8	13.1	82.9
Stuhr, Hans	Grand Island, Hall Co	16	250	18.9	15.8	83.3
Steinbeck, Diedt	do	3	202	19.4	16.0	82.3
Steinbeig, H	do	2	184	19.0	15.4	81.9
Stuhr, Gebs	do	6	384	17.8	14.4	80.7
Stalt, Hans	do	3	288	20.5	17.7	82.9
Stegemann, Ernst	Marquette, Hamilton Co	3	275	17.3	13.9	80.1
Stiller, Wilhelm	Grand Island, Hall Co	9	210	18.8	15.2	82.0
Stoltenberg, Claus	do	15	246	20.3	17.3	84.4
Steinmeyer, H	do	5	......	16.6	13.5	85.0
Stepe, Henry	do	1	136	19.9	16.2	81.9
Sundbeig, E. N	Dannebrog, Howard Co	2	130	18.9	15.1	83.6
Sueplsen, Fritz	Grand Island, Hall Co	1	......	18.6	15.9	......
Taylor, T. W	Columbus, Platte Co	1	113	20.4	18.3	89.7
Taylor, F. N	Wood River, Hall Co	1	187	21.2	17.4	82.0
Taylor, John R	Seward, Seward Co	1	165	18.8	15.3	81.3
Thavernet, G	Grand Island, Hall Co	2	......	15.5	14.0	89.6
Thompsen, John	do	14	218	19.5	16.5	84.7
Thomas, C. N	Chapman, Merrick Co	1	171	17.8	13.7	71.3
Thacker, W. R	Ravenna, Buffalo Co	1	......	16.1	13.1	81.4
Tinge, C	St. Libory, Howard Co	1	343	15.2	12.2	80.2
Tomanch, Fr	Nimberg, Butler Co	1	335	21.4	18.8	87.8
Tolkey, John	Rockville, Sherman Co	1	191	17.9	15.2	84.9
Trummer, Hermann	Grand Island, Hall Co	8	250	20.5	17.3	86.5
Turner, N. H	Columbus, Platte Co	1	161	21.8	19.6	89.9
Underhill, I. C	Cairo, Hall Co	1	343	18.8	15.5	82.5
Unger, August	St. Michael, Buffalo Co	1	......	17.8	14.2	79.8
Veudt, Chas	Clarks, Merrick Co	1	125	18.9	15.9	85.9
Veeder, W. H	Grand Island, Hall Co	1	180	20.2	17.0	84.1

Name.	Post-office address.	No. of samples.	Average weight of beet.	Total solids indicated by Brix spindle.	Sucrose in juice.	Purity coefficient.
			Grams.	Pr. ct.	Pr. ct.	
Vocke, Herman H	Grand Island, Hall Co	1	229	21.2	17.8	83.9
Voss, Hans	....do	18	261	19.1	15.7	82.6
Vose, Heinrich	....do	3	149	18.6	15.3	82.0
Wallter, Aug	Palmer, Merrick Co	1	230	20.6	18.4	89.3
Wagner, Bernhard	St. Libory, Howard Co	1	147	20.8	17.1	82.2
Waters, George	Clarks, Merrick Co	1	121	18.8	15.7	88.9
Wagner, Traugott	Grand Island, Hall Co	5	354	18.1	14.5	80.1
Wagner, Christ	St. Libory, Howard Co	11	323	18.9	15.7	83.4
Ward, C. E. & Co	Belvidere, Thayer Co	2	279	19.9	16.3	79.8
West, W. H	Cairo, Hall Co	1	....	17.2	13.9	....
Wells & Wieman	Schuyler, Colfax Co	11	478	20.2	15.7	77.6
Wegner, Herman	Grand Island, Hall Co	13	253	19.7	16.2	81.5
Werner, Franz B	....do	11	268	19.8	17.0	86.2
Weiss, Fred	....do	9	235	18.9	15.1	79.9
Weinhold, Paul and Weyer H.	....do	6	190	20.3	17.6	86.5
Weller, Conrad	....do	12	234	20.9	18.3	83.5
Wheeler, Jasel	Bromfield, Hamilton Co	2	213	20.2	17.4	85.9
Witt, C. F	Grand Island, Hall Co	1	416	20.6	17.3	83.9
Wilt, Heinrich G	Rockville, Sherman Co	1	101	19.6	16.9	86.2
Wiene, Bernt	Bromfield, Hamilton Co	1	....	....	....	....
Wissink, Jan	St. Libory, Howard Co	1	....	17.7	15.4	87.0
Wienhake, Heinrich	Grand Island, Hall Co	3	205	19.6	15.8	80.4
Windolph, Adam	....do	9	332	20.0	16.6	83.6
Williams, W. T. and W. G.	Alda, Hall Co	3	278	19.7	16.1	61.6
Wines, E. J	Grand Island, Hall Co	17	260	19.6	16.6	84.2
Wilkelmie, Wilh	Chapman, Merrick Co	8	195	18.3	14.9	81.0
Windolph, C	Grand Island, Hall Co	19	193	19.3	16.2	83.1
Wiese, Wm	....do	3	280	18.3	15.2	82.6
Will, Wm	Columbus, Platte Co	3	250	20.7	17.2	82.8
Witt, Wilhelm	Alda, Hall Co	3	161	19.2	15.5	82.8
Woodworth, T. L	Chapman, Merrick Co	2	141	19.5	15.9	81.3
Wulf, Wilhelm	Grand Island, Hall Co	8	208	18.7	14.8	79.5
Yessen, Peter	Chapman, Merrick Co	4	271	19.2	16.4	85.6
Do	....do	1	200	18.5	14.7	74.0
Yohnik, Henry		23	333	20.0	16.5	83.9
Zehrke, Julius	Ravenna, Buffalo Co	1	148	19.5	16.0	82.0
Zeleny, Jos	Nimberg, Butler Co	1	335	21.4	18.8	78.8
Zlanke, E	Grand Island, Hall Co	6	243	19.4	16.1	84.2
Tamsen, Fritz	Alda, Hall Co	6	197	19.9	15.7	78.5
Means		......	238.9	19.6	16.3	83.2

Total number of samples, 1,866.

CHARACTER OF BEETS DELIVERED TO THE GRAND ISLAND FACTORY.

Through the courtesy of Mr. H. T. Oxnard the Department was allowed to establish a laboratory in the sugar factory at Grand Island for the purpose of obtaining information in regard to the character of the beets entering into manufacture. In all about three thousand samples of beets were examined, a sample having been taken from every wagonload and every carload of beets delivered to the factory. These samples were taken in such a way as to give as nearly as possible the average character of all the beets worked. A large number of beets was taken from each sample, and after they had been properly cleaned and dried their average weight was taken. The beets were then rasped, the juice expressed, and an analysis made on the expressed juice. The total solid matter was determined by a specific-gravity spindle, and the percentage of sucrose in the juice was estimated by the polariscope. The purity efficient was determined by dividing the percentage of sucrose in the juice as indicated by the polariscope by the percentage of total solids as indicated by the spindle.

AVERAGE WEIGHT OF BEETS.

The average weight of all the beets examined was 238.9 grammes. This small size of the beet was doubtless due to the extremely dry season. The drought throughout the region covered by the sugar-beet fields was the most severe perhaps that has ever been known in the State of Nebraska. Ordinary crops such as corn were almost total failures, and it is a matter of encouragement to note that in such a season the beets, although not making an average yield, yet did fairly well. On the whole, however, it must be confessed that the results from an agricultural point of view were disappointing; but this disappointment must be chiefly attributed to the exceptionally severe drought already mentioned.

It is also doubtless true that in the practice of the new system of agriculture which is required for the proper production of sugar beets many failures were made, and perhaps very few of the farmers practiced that form of agriculture which was best suited to the soil and the season. In a soil which is apt to be dry, as in Nebraska, too much attention can not be paid to the importance of loosening the ground to a good depth. Deep plowing, followed by deep subsoiling, together with such harrowing and other treatment of the surface as will produce a perfect tilth, are absolutely essential to the production of a profitable crop.

The remarkably high percentage of sucrose shown in the juice is an evidence of the fact that the soil and climate of Nebraska are favorable to the production of a beet rich in crystallizable sugar. It must, however, not be forgotten that the extremely high percentage of sucrose in the juice is probably a reciprocal of the small size of the beet due to the dry season. Had the season been favorable to the production of a beet of average size, with a tonnage of from 15 to 20 per acre, the percentage of sucrose in the beets would doubtless have been less. This is well illustrated in the data obtained in the Department from the analysis of sugar beets sent from Nebraska. It is evident from the character of the samples which were received by the Department that the farmers have selected the larger beets to be sent on for analysis. It is seen by comparison of the respective sizes of the beets received for analysis by the Department with those received for manufacture at Grand Island that the beets sent on for analysis were about three times the size of those manufactured into sugar. It will also be noticed that in the beets received for analysis by the Department the percentage of sucrose is low as compared with those which entered into manufacture at Grand Island. It would therefore hardly be just to claim that beets as rich as those manufactured at Grand Island during the past season can be grown in quantities of from 15 to 20 tons per acre. It is not a matter of surprise that many of the farmers who grew beets are discouraged at the results of the first year's work. The planting and cultivation of the sugar beet, as is well known, are matters which require

great labor and expense, and when, therefore, an unfavorable season cuts the crop very short, it is but natural that the farmer should be discontented. It is, however, difficult to see how he could have done better with any other crop, and the fact that in many instances even with the present dry season the farmers of Nebraska were able to grow 10 or even 15 tons per acre, shows that with proper cultivation and proper attention in other ways to the growing crop the evils which attend a severe drought can be greatly mitigated if not altogether avoided. It is not the purpose of the Department to encourage farmers to engage in an industry which does not give promise of success; but it will be a matter of regret to every one who desires to see the success of the sugar industry if the discontent which naturally attends a very unfavorable season should be sufficient to deter farmers from continuing the cultivation of a crop which under ordinary conditions promises so fair a yield as sugar beets. It would be wiser on the part of the farmers to continue the cultivation of the sugar-beet until it has been demonstrated at least that even with favorable years it is not profitable. In that case it would be necessary to cease the cultivation of a crop which afforded no prospect of financial success.

EXPERIMENTS WITH SUGAR BEETS IN WISCONSIN.

Extensive experiments were carried on in Wisconsin during the season of 1891 by the Department in coöperation with the agricultural experiment station under direction of Prof. W. A. Henry.

The general directions for the work were given by the Department, but all the details thereof were left to the supervision of Professor Henry.

The results of the work were encouraging, and its data, arranged by F. W. Woll, chemist of the station, will be found following:

Seeds of the following six varieties of sugar beets were received from the U. S. Department of Agriculture in the beginning of May: Dippe's Vilmorin, Dippe's Klein Wanzlebener, Simon Legrand's White Improved, Bulteau Desprez Richest, and Lemaire's Richest. About 3 acres of land were prepared at the experiment farm for beet culture, and divided up between the varieties in proportion to the quantity of seed on hand. Arrangements were further made with five farmers living in different parts of the State to grow three of the varieties, viz: Simon Legrand's White Improved, Bulteau Desprez Richest, and Dippe's Klein Wanzlebener, on a piece of land, 3 square rods for each variety; to send samples of the beets grown at different times for examination of sugar content, and to report the results as regards culture and yield. Notice was given in the newspapers that a supply of sugar-beet seed was on hand for distribution among farmers who would investigate the adaptability of their soils for sugar-beet culture, with the obligation to send samples of the beets grown for analysis. In this way, samples of beets from seventy farmers were received and analyzed;

about half of these received their seed from the station, and the majority of the rest received seed directly from the U. S. Department of Agriculture.

First are given the results of the beet culture at the station, then those of the culture at substations, and finally the results of examinations of beets grown by farmers in different parts of this State.

SUGAR-BEET CULTURE AT WISCONSIN AGRICULTURAL EXPERIMENT STATION, SEASON 1890.

Two plats, $1\frac{1}{3}$ and $1\frac{1}{2}$ acres, were set apart for sugar beets during the spring of 1890. Potatoes had been grown on Plat A the preceding year; on Plat B clover was grown the preceding year, and the land plowed that fall; the soil was a light clay, a portion of Plat B being a sandy loam. The beets were planted in rows 20 inches apart on Plat A, with beets every 8 inches in the row, the following varieties were planted on May 27 on this plat: Dippe's Klein Wanzlebener, Simon Legrand's White Improved, Bulteau Desprez Richest, and Dippe's Vilmorin. On the other plat (Plat B) the beets were planted in rows 30 inches, with beets every 10 inches in the row; the following varieties were planted in this way on May 28: Florimond Desprez Richest, Lemaire's Richest, and Dippe's Vilmorin. The seed of the last variety was divided between the plats, so as to determine the influence of different thickness of planting on the yield of beets.

The beets received the very best treatment during their period of growth that the circumstances would allow. The heavy rains in the beginning and middle of June made cultivation impossible for a time, and gave the weeds more of a start than they would otherwise have had. The cultivation was done partly by a harrow tooth cultivator, or by a wheel hoe and shovel attachment with shields, or by hand. The weeds in the rows between the beets could not be reached in any other than by a hand hoe. The features of the growing season were plenty of rain in May, June, August, and October, with a temperature somewhat below normal during May, August, and September, and higher than normal in June. The main meteorological data for the season are given in the following table:

Meteorological data for summer, 1890, for Madison, Wis.

[From observations made at Washburn Observatory.]

Month.	Temperature.				Rainfall.	
	Max.	Min.	Mean.	Mean normal.	1890.	Normal.
	°F.	°F.	°F.	°F.	*Inches.*	*Inches.*
May	84	33	53.0	57.8	5.03	3.64
June	93	50	70.6	67.2	7.72	4.42
July	91	54	71.7	72.7	1.81	4.19
August	93	46	66.1	69.4	4.23	3.28
September	83	36	57.4	61.0	2.62	3.35
October	69	25	48.2	48.5	4.59	2.87
Total	......	......	......	......	25.00	21.75

Samples of the beets grown were taken every week from September 5 on. Three to four beets of every variety of what seemed average size were pulled and the average sugar content in the same ascertained by the polariscope. While it is not believed that the beets sampled in every case represented exactly the stage of growth of each variety at the time, the analysis may indicate in a general way the increase in sugar content and in the purity of the juice of the beets. The following table gives the results of the weekly examinations of each plat. The average weight of the beets sampled is also given:

Plat A.

[Distance between rows, 20 inches; between beets in the row, 8 inches.]

Date.	Dippe's Vilmorin.			Bulteau Desprez.			Klein Wanzlebener.			Simon Legrand.			Average sucrose in juice.	Purity coefficient.
	Average weight of beets.	Sucrose in juice.	Purity coefficient.	Average weight of beets.	Sucrose in juice.	Purity coefficient.	Average weight of beets.	Sucrose in juice.	Purity coefficient.	Average weight of beets.	Sucrose in juice.	Purity coefficient.		
	Grms.	*P. ct.*		*Grms.*	*P. ct.*		*Grms.*	*P. ct.*		*Grms.*	*P. ct.*		*P. ct.*	
Sept. 5	452	11.87	78.2	239	10.79	73.4	355	11.77	77.5	476	11.81	82.9	11.56	78.0
15	551	12.91	86.6	578	12.72	80.2	482	13.02	83.4	591	12.51	77.7	12.79	82.0
22	453	15.29	85.3	631	13.87	83.1	472	14.74	83.3	640	13.38	82.6	14.27	83.6
30	401	15.78	86.9	604	15.27	84.1	409	14.06	82.7	495	15.38	84.7	15.12	84.6
Oct. 7	535	17.64	85.6	574	14.85	83.9	588	16.14	83.7	388	16.68	87.1	16.33	85.1
16	670	*15.43	84.5	561	15.52	86.1	486	14.33	84.8	900	14.60	84.2	14.97	84.9
23	419	16.01	85.0	324	16.03	87.2	547	15.92	87.7	506	16.15	83.8	16.03	85.9
30	566	16.76	86.3	567	14.81	83.9	407	16.39	82.2	686	15.74	83.2	15.93	83.9

* A sample taken October 17 gave 16.37 per cent of sugar; purity coefficient, 84.9; average weight of beets, 527 grammes.

Plat B.

[Distance between rows, 30 inches; between beets in the row, 10 inches.]

Date.	Dippe's Vilmorin.			Lemaire's richest.			Florimond Desprez Richest			Average sucrose in juice.	Purity coefficient.
	Average weight of beets.	Sucrose in juice.	Purity coefficient.	Average weight of beets.	Sucrose in juice.	Purity coefficient.	Average weight of beets.	Sucrose in juice.	Purity coefficient.		
	Grams.	*Per ct.*		*Grams.*	*Per ct.*		*Grams.*	*Per cent.*		*Per ct.*	
Sept. 9	528	13.08	76.9	963	10.76	79.5	656	10.05	71.7	11.30	76.0
15	492	12.17	80.1	637	9.88	74.3	792	10.14	72.5	10.73	75.6
22	388	16.05	87.3	713	14.09	85.8	672	11.45	79.5	13.86	84.2
30	403	17.32	84.9	576	14.37	83.8	1,107	13.44	82.9	15.04	83.9
Oct. 7	512	16.10	84.9	712	14.56	83.5	612	12.59	79.5	14.42	83.0
16	642	17.30	84.8	1,049	14.52	80.0	887	13.80	81.6	15.21	82.1
24	540	15.57	84.7	731	14.98	83.2	886	12.83	78.7	14.45	82.2
Nov. 1	588	15.74	86.0	1,031	16.32	82.8	905	14.84	82.4	15.63	83.7

Perfectly representative samples were not always secured, as will be seen, but the analyses show nevertheless in a general way the change in the sugar content of the juice and its purity with the advance of the season. The last series of determinations for both plats were made at harvesting time; the results given for this State (November 1) are the averages of three samples of beets, of four each, taken from different parts of the plat, the beets being average sized and, as nearly as could be, representative ones. The beets reached full maturity, as may be

inferred from the above table, from September 30 to October 7; after that time the percentage of sugar in the beets remained about stationary. As regards the possible yield at that early period we have no data to judge from except that the weights of the beets sampled might indicate that there was no material increase after that period.

As the varying percentages found at the different periods doubtless stand in a definite relation to the rainfall, we give below the days on which rain fell at this place between September 1 and November 1:

Rainfall at Madison, Wis., September and October, 1890.

Date.	Amount.	Date.	Amount.	Date.	Amount.	Date.	Amount.
	Inches.		*Inches.*		*Inches.*		*Inches.*
Sept. 3	0.18	Oct. 9	0.56	Sept. 25	0.08	29	trace
4	1.81	11	0.64	26	trace	31	0.01
6	trace	12	0.98	Oct. 1	0.03		
7	0.02	13	0 52	2	0.23		
12	trace	15	0.23	3	trace		
15	0.38	16	trace	4	0.08		
17	trace	18	0.72	5	trace		
18	trace	25	0.31	6	0.12		
19	0.15	26	trace	7	0.16		

DATA OBTAINED AT HARVESTING TIME.

[October 30 to November 1.]

The area taken up by each variety and the yield of beets as ascertained at harvesting time are given here:

Variety.	Area grown.	Yield.	Sugar in the juice.
	Sq. feet.	*Pounds.*	*Per cent.*
Plat A:			
Dippe's Vilmorin	2,470	3,040	16.76
Bulteau Desprez Richest	8,352	11,804	14.81
Simon Legrand	26,375	27,866	16.39
Klein Wanzlebener	28,750	25,650	15.74
Plat B:			
Dippe's Vilmorin	13,311	11,920	15.74
Lemaire's Richest	22,264	21,006	16.32
Florimond Desprez Richest	20,685	24,844	14.84

A good deal of dirt adhered to the beets as they were weighed. In order to ascertain the yield per acre of washed beets, a basketful of each load of beets was taken out and weighed, each variety being kept by itself; when all loads from each variety had been taken from the field, the beets taken out were all carefully washed, dried, and weighed. In this way the percentages of dirt adhering to the beets were ascertained, as follows:

	Per cent.
Plat A:	
Vilmorin	24.79
Bulteau Desprez	15.70
Simon Legrand	13.10
Klein Wanzlebener	12.11
Plat B:	
Vilmorin	24.23
Lemaire	15.70
Florimond Desprez	10.52

Basing calculations on these figures, we obtain the following yields per acre of washed beets of each variety:

Yield of washed beets.

	Pounds.
Plat A (beets 20 by 8 inches apart):	
Vilmorin	40,420
Bulteau	51,900
Simon Legrand	39,930
Klein Wanzlebener	34,150
Plat B (beets 30 by 10 inches apart):	
Vilmorin	29,430
Lemaire	34,630
Florimond Desprez	46,710

The data on hand are insufficient to determine the actual yield of sugar per acre in case of each variety. On the supposition that all varieties contained approximately the same percentage of juice, they would rank as follows as regards their sugar-producing capacity: 1. Bulteau Desprez; 2. Vilmorin (plat A); 3. Florimond Desprez; 4. Simon Legrand; 5. KleinWanzlebener; 6. Lemaire; 7. Vilmorin (plat B).

QUANTITY OF TOPS OBTAINED FROM BEETS.

The tops from a number of beets were weighed separately when the first determination was made, September 5, and also at harvesting time, to obtain some data as regards the proportionate increase of the beet root with the period of growth, and also the relation of leaves to roots with the different varieties.

Proportion of washed roots to leaves.

	Roots : leaves as 100 :
Plat A:	
Vilmorin, September 5	60
November 1	34
Bulteau Deprez, September 5	132
October 31	17
Simon Legrand, September 5	68
October 30	23
Klein Wanzlebener, September 5	79
November 1	—
Plat B:	
Vilmorin, September 9	84
November 1	37
Lemaire, September 9	79
November 1	36
Florimond Desprez, September 9	66
November 1	36

As has always been found, the proportion of leaves is larger in the earlier stages of growth. Between the different varieties there is some difference, Bulteau Desprez and Simon Legrand White Improved containing a smaller proportion of leaves at the time of harvesting than the other varieties.

Summing up the discussion of the work for the last season it is noticed that the yield of sugar beets obtained as well as their sugar content was very satisfactory; the season could not be considered favorable to sugar-beet culture on account of the heavy rains in the fall. When, in spite of this, crops were secured of 15 to 25 tons per acre of beets, containing a good percentage of sugar, it would seem that the question whether or not sugar-beet culture may prove profitable can not be answered in any other way than the affirmative.

WORK DONE AT SUB-STATIONS.

Five sub-stations were established in different parts of the State to study the adaptability of the different regions to sugar-beet culture. The names of the farmers who undertook the work with their addresses are F. W. Roberts, Woodworth, Kenosha County; Paul M. Peirce, Germania, Marquette County; Fred. Burton, Janesville, Rock County; L. F. Noyes, Hudson, St. Croix County; A. L. Grengo, Colgate, Waukesha County.

Of these stations three lie in the southern portion of our State, viz: Woodworth, near Lake Michigan; Janesville at about the same latitude in the inner part of the State; and Colgate about 20 miles west of Milwaukee. Germania lies in the central portion of the State, about 50 miles north of Madison; Hudson lies in the northwestern corner of the State, about 10 miles east of St. Paul (at 45° latitude).

Directions were sent to select a small piece of land, about 3 square rods, of a kind that would be favorable to a good crop of potatoes; to give the beets good cultivation, and to keep careful notes as regards labor spent and method of planting and cultivation. The following varieties were sent to each sub-station: Bulteau Desprez Richest, Simon Legrand's White Improved, and Dippe's Klein Wanzlebener. The data as to the kind of soil, time of planting, etc., are given in the following table:

Data concerning sub-stations.

Name of sub-station.	Kind of soil.	Planted to each variety.	Previous crop on land.	Date of planting.	Distance between rows.	Distance between beets after last thinning.	Time spent in cultivating and thinning.	Date of harvesting.
		Sq. ft.			*In.*	*In.*	*Hrs.*	
Woodworth, Kenosha Co	Light sandy	797	Potatoes	May 29	18	4–6	24	Oct. 28
Germania, Marquette Co	Loam	550	Clover	May 19	18	6	45	Oct. 28
Janesville, Rock Co	Black loam	817	Pasture	May 15	20	6	37	Oct. 28
Hudson, St. Croix Co	Black sandy	817	Oats	May 19	18	(*)	20	Oct. 29
Colgate, Waukesha Co	Clay loam	1,221	Timothy	May 31	18	8	54	Nov. 16

* Simon Legrand, 16 inches; Klein Wanzlebener, 12 inches; Bulteau Desprez Richest, 20 inches. Seed did not all grow, hence the great distance between beets in the row.

In order to study the development of the beets at each place, during the fall four samples of each variety grown were secured from each station between the middle of September and the date of harvesting. On the arrival of the samples at the station they were weighed and the juice polarized. The results of the examinations are given in the following table.

Sugar beets from substations.

1. FROM F. W. ROBERTS, WOODWORTH, WIS.

Date.	Bulteau-Desprez Richest.			Simon Legrand White Improved.			Dippe's Klein-Wanzlebener.		
	Average weight of beets.	Sugar in juice.	Purity coefficient.	Average weight of beets.	Sucrose in juice.	Purity coefficient.	Average weight of beets.	Sucrose in juice.	Purity coefficient.
	Grams.	*Per ct.*		*Grams.*	*Per ct.*		*Grams.*	*Per ct.*	
Sept. 18	237	10.72	77.7	455	10.69	80.3	461	12.37	85.3
Oct. 8	458	10.26	75.3	476	12.51	81.2	451	12.91	81.5
" 15	782	9.87	74.9	586	11.77	80.7	816	11.96	79.5
" 30	614	12.81	79.6	578	12.87	78.9	585	13.45	79.6
2. FROM PAUL M. PEIRCE, GERMANIA, WIS.									
Sept. 23	325	12.04	80.8	463	12.70	80.1	381	13.93	91.7
Oct. 7	248	12.98	83.1	546	13.41	82.8	555	13.84	85.4
" 18	682	13.58	85.7	428	13.05	82.2	796	13.27	81.9
Nov. 4	722	13.79	83.2	783	13.68	83.2	832	15.50	84.9
3. FROM FRED. BURTON, JANESVILLE, WIS.									
Sept. 25	608	15.24	85.1	561	14.14	83.2	687	13.75	77.2
Oct. 8	438	16.00	80.2	418	15.08	82.6	421	14.40	81.9
" 17	483	13.17	83.0	581	15.29	79.8	672	13.80	82.3
Nov. 7	551	14.77	85.2	516	13.04	82.8	479	14.31	83.1
4. FROM L. F. NOYES, HUDSON, WIS.									
Sept. 23	197	13.14	78.2	179	13.71	82.8	208	13.91	85.3
Oct. 6	228	14.84	78.8	205	14.13	82.1	164	14.86	83.0
" 20	186	14.89	79.6	179	16.12	79.9	158	16.83	84.4
Nov. 4	203	12.99	75.5	232	13.60	79.0	243	15.44	83.5
5. FROM A. L. GRENGO, COLGATE, WIS.									
Sept. 26	504	14.92	86.0	491	14.69	85.4	605	15.10	83.4
Oct. 9	667	16.25	81.4	761	15.07	80.0	1,040	14.42	81.5
" 18	632	12.53	80.7	925	12.77	80.0	1,046	12.51	79.5
Nov. 12	829	17.14	84.5	791	15.95	87.4	1,047	14.95	83.2

It would seem from this table that the beets did not improve materially at any place as far as sugar content and purity of the juice are concerned after the beginning of October. At the Janesville Substation the beets seem to have been as mature and rich on September 25 as at any time later on. At the Hudson Station the beets never grew large (weighing on the average not more than half a pound apiece), and they seem to have been about as far advanced when the first sample

was taken as later on; the light yield is explained by the cold wet weather at Hudson when the seed was planted, causing the seed to rot; potatoes planted there at the same time also rotted.

The mean temperature and rainfall at St. Paul during the past season and normally were as follows:

Meteorological data for St. Paul, Minn., May to October, 1890.

Months.	Temperature.		Rainfall.	Normal rainfall.
	Mean.	Mean normal.		
	°F.	°F.	*Inches.*	*Inches.*
May	52.2	58.4	3.66	3.34
June	69.8	67.1	5.29	4.85
July	71.9	71.6	1.87	3.26
August	65.0	69.5	2.20	3.67
September	58.2	58.9	2.73	3.38
October	46.0	47.1	2.79	2.05
Total	....	....	18.54	20.55

The other stations produced beets of average size, with a good to fair percentage of sugar. The yields of beets at the different places may be seen from the following table, and also the estimated yield per acre:

Sugar beets from substations.

Name.	Bulteau Desprez.				Simon Legrand.				Klein Wanzlebener.			
	Area grown.	Yield of beets.	Sugar in juice.	Yield per acre.	Area grown.	Yield of beets.	Sugar in juice.	Yield per acre.	Area grown.	Yield of beets.	Sugar in juice.	Yield per acre.
	Sq. ft.	*Lbs.*	*Per ct.*	*Lbs.*	*Sq. ft.*	*Lbs.*	*Per ct.*	*Lbs.*	*Sq. ft.*	*Lbs.*	*Per ct.*	*Lbs.*
F. W. Roberts, Woodworth	796.75	1,095	11.81	59,880	796.75	915	12.87	50,010	796.75	1,075	13.45	58,790
P. M. Peirce, Germania	550.00	410	13.79	32,470	550.00	200	13.68	15,840	550.00	610	15.50	48,310
Fred Burton, Janesville	816.75	600	14.77	32,000	816.75	486	13.04	25,880	816.75	575	14.31	30,670
L. F. Noyes, Hudson	816.75	163	12.99	8,694	816.75	174	13.60	9,279	816.75	185	15.44	9,868
A. L. Grengo, Colgate	1,224.00	2,093	17.14	77,470	1,224.00	1,851	15.95	67,410	1,224.00	2,146	14.95	76,370

In judging these results, it must be remembered that the area grown was small, and hence the yield per acre must be taken only as an indication of what might be reached under very favorable conditions. The yield found at the Colgate substation is higher than that of any of the other stations, going even up to 38 tons in case of Bulteau Desprez Richest and following closely with the other varieties. The yield of beets as well as their richness may be pronounced satisfactory in all cases except in case of the Hudson station, where the yield was very light, for reasons already stated. The climatic conditions of the four Southern stations probably did not vary very much from those of Madison, which have been previously given.

As it was deemed of some interest, the weights of leaves were ascertained at harvesting time along with those of the beets. In the following table are given the percentage weights of leaves, calculated on weight of beets:

Relation between tops and beets at substations.

Substation.	Bulteau Desprez Richest.	Simon Legrand White Imp.	Dippe's Klein Wanzlebener.
	Weight of beet root: weight of tops as 100:		
Germania, Marquette Co	67	60	50
Woodworth, Kenosha Co	55	52	63
Janesville, Rock Co	54	70	67
Hudson, St. Croix Co	40	34	41
Colgate, Waukesha Co	55	59	58
Average	54	55	56

EXAMINATION OF BEETS FROM FARMERS IN DIFFERENT PARTS OF THE STATE.

It remains to give an account of the work done during the past season in analyzing sugar beets grown by farmers in different parts of the State, the seeds having been mostly obtained, either directly or indirectly, from the U. S. Department of Agriculture. Realizing the importance of the sugar-beet problem and the widespread interest in its solution, this station had notices published in all newspapers in the State offering to analyze free of charge beets grown anywhere in the State. As a result, 70 farmers in 28 counties of the State sent in samples of sugar beets for analysis. The results are given in the following table, along with such information about the beets as it was possible to obtain—variety, soil, time of planting and harvesting, etc.:

Sugar beets in Wisconsin, season 1890, arranged alphabetically according to counties.

Number.	Name of grower.	Post-office.	County.	Variety.	Seed obtained from—	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
									Grams	P. ct.	P. ct.		
1	John B. Meyer	Modena	Buffalo	White Siberian	S Wilson, Mechanicsville, Pa.	May 3	Oct. 20	Black prairie	1,135	14.48	10.29	71.2	
2	Henry N. Petersen	New Holstein	Calumet	Klein Wanzlebener.	U. S. Department Agriculture.	Mid. May	Oct. 23	Black loam	402	21.40	17.91	83.7	
3	Herm. Kroehnke	do	do		do	May 20	Nov. 5	Loam	549	18.60	16.20	87.1	
4	Claus Edens	do	do	Klein Wanzlebener.	do	May 20	Nov. 1	Dark loam	415	21.05	18.40	87.4	8 inches apart, rows 16 inches apart.
5	Aug. A. Paulson	do	do	do	do	June 15	Nov. 1	Clay	265	22.15	18.79	84.9	Unmanured.
6	Dr. E. F. Russell	Poynette	Columbia	Florimond	Wisconsin Experiment Station.	June 4	Oct. 3	Heavy clay	924	15.40	11.68	75.8	Do.
7	do	do	do	do	do	June 5	Sept. 30	Prairie	321	15.52	9.97	64.2	Do.
8	do	do	do	do	do	June 7	Oct. 1	Sandy loam	669	16.20	13.00	80.1	Do.
9	do	do	do	do	do	June 5	Sept. 30	Prairie	853	15.85	10.95	69.1	Do.
10	W. R. Chipman	Leeds Center	do	do	do	May 31	Oct. 27	Black loam	1,833	15.85	12.59	81.4	Barnyard manure.
11	do	do	do	do	do	May 31	Oct. 27	do	867	16.20	12.86	79.5	Unmanured.
12	D. L. Cuff	Rocky Run	do	do	do	June 10	Oct. 15	Sandy loam	1,729	15.52	11.59	74.9	
13	H. P. Johnson	Columbus	do	Vilmorin	do	June 1	Nov. 1	Clayey	1,040	17.80	14.74	82.8	Do.
14	Wm. Strhemil	do	do	do	do	June 1	Nov. 1	Black loam	2,524	15.05	10.93	72.7	Do.
15	R. K. Beecham	Sun Prairie	Dane	Unknown	Jas. Vick, Rochester, N. Y.	June 1	Oct. 10	Puttor heavy clay.	1,415	11.65	8.26	70.9	Do.
16	do	do	do	do	do	June 1	Oct. 10	do	1,224	11.05	8.18	74.0	Do.
17	Leslie Wright	Danville	Dodge	Vilmorin	Wisconsin Experiment Station.	May 28	Oct. 13	Yellow sandy loam.	1,622	12.88	8.84	70.8	
18	F. C. Cooper	do	do	do	do	May 29	Oct. 13	Yellow clay loam.	1,609	15.28	12.13	79.5	Unmanured.
19	John Weston	Burnett	do	Florimond	do	May 30	Oct. 29	Black loam	298	15.05	11.07	73.6	Barnyard manure.
20	Aug. Woinowsky	Menomonie	Dunn	White Imperial	John Salzer, La Crosse, Wis.	May 30	Oct. 10	Sandy loam	866	12.94	9.45	73.0	Unmanured.
21	Aug. Peter	do	do	do	do	May 17	Oct. 11	do	643	15.86	12.56	79.2	Do.
22	Sam. Welke	Fall Creek	Eau Claire	do	do	May 5	Oct. 20	Fine sandy loam mixed with clay.	1,011	12.48	7.91	63.4	Barnyard manure.
23	H. D. Hitt	Oakfield	Fond du Lac	Florimond	Wisconsin Experiment Station.	May 29	Oct. 2	Heavy clayed loam.	850	17.19	12.84	74.7	Do.
24	Wm. Merrell	Oak Centre	do	Globe Sugar	Bryce & Furgeson, Waupaca.	May 30	Oct. 28	Clay loam	1,283	11.42	7.89	69.1	Raised for stock.

Sugar beets in Wisconsin, season 1890, arranged alphabetically according to counties—Continued.

Number.	Name of grower.	Post-office.	County.	Variety.	Seed obtained from—	Time of planting	Time of harvesting.	Soil.	Average weight of beets.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
									Grams	*P. ct.*	*P. ct.*		
25	John H. Wise	Platteville	Grant	Florimond	Wisconsin Experiment Station.	May 31	Oct. 20	Black loam	719	14.48	10.16	70.3	Barnyard manure.
26	do	do	do	do	do	June 9	Oct. 20	Newly broken timber soil.	966	10.92	6.48	59.3	Unmanured.
27	do	do	do	do	do	June 2	Oct. 20	Black loam	1,435	11.42	6.82	59.7	Do.
28	Geo. M. Thomas	Mineral Point	Iowa	do	do	June 12	Oct. 16	Black soil	620	16.78	13.19	78.6	Do
29	do	do	do	do	do	June 12	Oct. 16	do	650	15.62	12.30	80.6	Do.
30	Geo. E. Kelly	do	do	do	do	May 24	Nov. 1	Clay	590	15.62	11.98	76.7	Do.
31	do	do	do	do	do	May 24	Nov. 1	Garden soil	838	15.40	11.52	74.8	Barnyard manure.
32	R. Crossfield	Fort Atkinson	Jefferson	Vilmorin	do	May 29	Oct. 1	Clay loam	498	16.90	12.94	76.6	Unmanured.
33	Niles Deforest	do	do	do	do	June 1	Oct. 1	do	471	16.41	12.94	78.8	Do.
34	John B. Millard	Lake Mills	do	do	do	June 1	Oct. 20	Heavy dark loam.	839	18.60	13.94	74.9	Do.
35	do	do	do	do	do	June 1	Oct. 20	Red clay	1,285	16.90	13.48	79.7	Do.
36	Geo. W. Kindlin	Fort Atkinson	do	Florimond	do	May 30	Oct. 6	Sandy loam	527	16.32	12.78	78.3	Barnyard manure.
37	Hon. F. A. Hoffman.	Jefferson	do	Vilmorin	Vaughan, Chicago	Apr. 29	Oct. 2	Rich clay loam	1,085	15.51	11.55	74.5	Do.
38	do	do	do	do	do	Apr. 29	Oct. 2	do	1,484	14.59	10.98	75.8	Do.
39	Peter Benz	Kewaunee	Kewaunee	do			Sept. 24	Heavy clay	1,206	17.70	13.96	78.9	
40	Frank Paula	do	do	Bohemian	Imported		Sept. 21	do	764	10.91	7.63	69.3	
41	Joseph Jetek	do	do	do	do		Sept. 24	Black clay soil	835	15.51	12.53	80.8	
42	Peter Benz	do	do	Vilmorin					800	19.95	16.38	82.1	
43	Joseph Jetek	do	do	Bohemian					918	18.38	14.80	80.5	
44	Mates Plouhar	do	do	Klein Wanzlebener.	Imported				496	18.82	16.29	86.6	
45	Frank Albrecht	do	do	do					691	17.70	14.72	83.2	
46	Anton Galenberger	do	do	do	Imported				743	16.90	13.26	78.5	
47	W. Holub	do	do	K. P	do				522	18.70	16.78	89.7	
48	A. Mattik	do	do	Bohemian	do				1,115	15.05	12.55	83.4	
49	F. Koimek	do	do	Desprez					870	16.55	13.76	3.2	
50	Rev. Bergholz	do	do	Unknown					1,480	14.25	9.98	69.4	
51	John Jellineck, jr.	do	do	do					960	21.40	17.25	80.6	
52	Math. Wochos	Stangelville	do	Desprez Richest	U. S. Department Agriculture.	May 20	Oct. 10	Sandy loam	856	20.18	17.31	85.8	Barnyard manure.
53	John Dawson	La Crosse	La Crosse	Unknown	Jos. Harris, Rochester, N. Y.	May 7	Nov. 5	Clay loam	1,531	13.18	9.85	74.7	Do.
54	Thomas Mohr	Manitowoc	Manitowoc	do	A. Landreth, Manitowoc.	May 15	Oct. 10	Black loam	663	18.70	15.24	81.5	Do.
55	do	do	do	do	do	May 15	Oct. 10	do	936	16.65	13.46	80.8	Do.
56	A. Lindner	Kiel	do						1,505	15.86	11.22	72.4	

57	Fred. Burow	West Granville	Milwaukee	Imperial	Erfurt, Germany	June 10	Oct. 25	Clay	91	418.60	16.09	86.5	Barnyard manure.
58	....do	....do	....do	Mangold	....do	June 10	Oct. 25	....do	95	318.60	16.33	87.8	Do.
59	G. H. Rawson	Oak Creek	....do	Lemaire's	Wisconsin Experiment Station.	June 1	Nov. 3	Black sandy loam.	91	718.02	15.33	85.1	Unmanured.
60	Julius Roebel	West Granville	....do	....do	U. S. Department Agriculture.	May 20	Oct. 28	Black loam	82	419.28	17.08	88.6	Do.
61	....do	....do		Florimond	....do	May 20	Oct. 28	....do	84	418.95	16.10	84.9	
62	S. Wehrmann	Binghamton	Outagamie		J. Vick, Rochester, N. Y.	May 15	Oct. 15	Black clayey	1,48	217.12	12.90	75.4	
63	E. Barkhausen	Thiensville	Ozaukee	Lemaire's	Wisconsin Experiment Station.	May 1	Oct. 19	Black sandy loam.	38	214.00	10.98	78.5	Unmanured.
64	H. Wehmhoff	Burlington	Racine	Vilmorin	....do	May 31	Oct. 9	Black sandy	86	617.22	13.86	80.5	Sheep manure.
65	F. E. Carswell	Lone Rock	Richland						2,63	310.99	6.48	59.2	
66	E. G. Snyder	Clinton	Rock	Vilmorin	Wisconsin Experiment Station.	June 7	Oct. 3	Sandy clay	38	418.60	15.17	81.5	Unmanured.
67	P. F. Newell	Jewett Mills	St. Croix	....do	....do	June 1	Oct. 18	Black loam	43	618.70	14.37	76.9	Barnyard manure.
68	M. E. Seymour	Reedsburgh	Sauk	Lane's Imperial	U. S. Department Agriculture.	May 15	Oct. 16	....do	1,35	810.1	6.39	63.3	Unmanured.
69	J. W. Wood	Baraboo	....do	Florimond	Wisconsin Experiment Station.	May 24	Oct. 3	Clay loam	81	114.70	10.92	74.3	Barnyard manure.
70	A. E. Marker	Reedsburgh	....do	French White Sugar.	T. D. Ferry & Co., Detroit, Mich.	May 15	Oct. 15	Sandy loam	1,86	412.95	8.88	68.5	Do.
71	E. A. Dwinnell	North Freedom	....do	Lane's Imperial	U. S. Department Agriculture.	May 15	Oct. 6	Clay loam	1,19	913.55	10.37	76.5	
72	S. A. McCoy	....do	....do	Imperial Sugar-beet.	....do	May 18	Oct. 8	....do	1,310	12.72	8.69	68.3	Barnyard manure.
73	Louis Ballschmieder.	Sheboygan Falls	Sheboygan	Simon Le Grand	....do	May 18	Oct. 15	Black loam	938	11.42	8.11	71.0	Unmanured.
74	....do	....do	....do	Lane's Imperial	D. M. Ferry & Co., Detroit, Mich.	May 12	Oct. 12	Sandy loam	764	11.52	8.58	74.7	Do.
75	....do	....do	....do	Klein-Wanzlebener.	U. S. Department Agriculture.	May 18	Oct. 12	Black loam	542	14.70	11.55	78.6	Do.
76	....do	....do	....do	Vilmorin	D. M. Ferry & Co., Detroit, Mich.	May 18	Oct. 16	....do	834	14.92	12.27	82.2	Do.
77	....do	....do	....do	French Yellow	Germany	May 20	Oct. 15	....do	842	11.52	8.08	70.1	Do.
78	A. J. Lamberson	Whitehall	Trempealeau	Lemaire's	Wisconsin Experiment Station.	June 10	Oct. 5	....do	1,482	16.20	12.39	76.5	Do,
79	Leslie Clark	Galesville	....do	Vilmorin	....do	June 8	Oct. 12	Black heavy soil.	770	16.20	12.86	79.4	Horse manure.
80	C. D. Wolfrem	West Bend	Washington	Florimond	....do	May 30	Oct. 7	Hard clay	823	18.60	15.77	84.7	Unmanured.
81	F. Van Rhienen	South Germantown.	....do	....do	Crete, Nebr	Apr. 28	Sept. 30	Sandy loam	1,386	17.80	14.74	82.8	Barnyard manure.
82	Mary Henrick	....do	....do	....do	....do	May 15	Oct. 16	....do	629	17.70	14.58	82.4	Do.
83	John Gebhardt	....do	....do	....do	....do	May 15	Oct. 15	....do	1,040	16.42	13.45	81.9	Do.
84	....do	....do	....do	German Unknown Variety.	Menomonee Falls.	May 15	Oct. 15	....do	1,017	14.35	11.27	78.5	Do.
85	E. L. Nehs	Menomonee Falls	Waukesha	Mangold	Germany	May 25	Oct. 17	Black loam	1,039	17.55	14.35	81.7	Unmanured.
86	Mat. Debus	....do	....do	....do		May 25	Oct. 21	....do	1,350	14.82	11.16	75.3	Do.

Sugar beets in Wisconsin, season 1890, *arranged alphabetically according to counties*—Continued.

Number.	Name of grower.	Post-office.	County.	Variety.	Seed obtained from—	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
									Grams	*P. ct.*	*P. ct.*		
87	Mat. Debus	Menomonee Falls.	Waukesha	Vilmorin	Germany	May 25	Oct. 21	Black loam	934	15.75	12.44	78.9	Barnyard manure.
88	...do	...do	...do	Imperial		May 25	Oct. 21	...do	1,323	17.35	14.12	81.4	Do.
89	John Bender	Oconomowoc	...do	Lemaire's	Wisconsin Experiment Station.	June 5	Oct. 8	Clay loam	1,211	17.35	13.88	79.9	Do.
90	Chelsea E. Jones	North Prairie	...do	Vilmorin	...do	May 29	Oct. 14	Sandy	1,020	16.20	13.03	80.4	Do.
91	Chas. Churchill	Waupaca	Waupaca	Lemaire's	...do	June 1	Oct. 13	Loam	1,031	15.75	12.54	79.6	Unmanured.
92	B. L. Tayler	Iola	...do	...do	...do	May 10	Oct. 15	Clayey loam	1,324	17.35	13.82	79.7	Barnyard manure.
93	R. H. Fisher	Oshkosh	Winnebago	Imperial Sugar	Jno. A. Salzer, La Crosse.	May 12	Oct. 31	Black loam	875	16.20	12.30	76.0	Do.

The above analyses of sugar beets grown in this State during the last season have a very wide range, viz, from 6.39 to 18.79 per cent of sugar in the juice; of the 95 analyses given in the above table, 19 come below 10 per cent of sugar, 56 come above 12 per cent, 38 above 13 per cent, and 16 above 15 per cent of sugar in the juice. But very few of the farmers who sent in beets for analysis had previously had any experience in growing beets; besides this some of the beets were grown for stock food, with no intention of testing their sugar-producing capacity. Bearing this in mind, it would seem that the showing is a very creditable one; where grown for sugar, and where good care was bestowed, the beets contained a high percentage of sugar. As regards the yield, but very few and uncertain data were obtained, most of the farmers having grown only small plats, from which an estimated yield was reported.

Of the different portions of the State, the eastern region seems better adapted for sugar-beet culture than the western, as far as the data on hand will enable us to judge about the matter. Judging from the data obtained, which are of course very limited, it may further seem that three regions may prove especially well adapted for the culture of sugar beets of the localities from which beets were received during the past season, viz, the country around New Holstein, Calumet County, (latitude about 44°); around South Germantown, Washington County, and around Kewaunee, Kewaunee County (latitude 44.5°). The average of all analyses from New Holstein was found to be the very high figure of 17.83 per cent of sugar in the juice; the average for South Germantown was 13.51 per cent, and for Kewaunee 13.85 per cent (of the fourteen samples received from this locality, twelve came above 12 per cent, and seven above 14 per cent of sugar in the juice). Also other localities may prove well adapted for sugar-beet culture, which have not yet been investigated outside of our substations, *e. g.*, the counties of Rock, Jefferson, Waukesha, Washington, Milwaukee, and Ozaukee, in short the whole eastern portion of the State.

A continued study of this subject may disclose other sections where sugar-beet culture may be conducted successfully. The work has just been entered upon. From what has been done at this experiment station and at substations in different parts of the State, it is known that good crops of beets can be grown of a good quality. While the results reached so far would indicate that Wisconsin may prove well adapted for the culture of sugar beets, the work must be repeated for several seasons before the question can be considered as fully settled.

EXPERIMENTS WITH SUGAR BEETS AT FORT SCOTT, KANSAS.

Quite a number of samples of beets was analyzed at Fort Scott with the following results:

In the juice.

Date.	Total solids.	Sugar.	Purity.	Date.	Total solids.	Sugar.	Purity.
	Per cent.	*Per cent.*			*Per cent.*	*Per cent.*	
Sept. 26	....	....	....	Nov. 1	15.0	12.2	81.3
Oct. 8	13.13	9.6	73.11	Nov. 1	15.4	12.8	83.1
Oct. 15	15.5	11.5	74.2	Nov. 1	16.8	12.2	72.6
Oct. 18	18.17	13.7	75.4	Nov. 1	15.7	11.7	74.5
Oct. 18	13.84	10.25	74.1	Nov. 1	16.6	13.7	82.5
Oct. 23	13.54	9.5	70.9	Nov. 1	15.7	12.9	82.2
Oct. 23	15.17	12.5	82.4	Nov. 1	19.1	16.7	87.4
Oct. 31	14.85	11.5	77.4	Nov. 1	14.4	11.1	77.7
Nov. 1	15.8	13.25	83.8	Nov. 1	14.0	10.6	75.7

A few of these samples showed good qualities for sugar making, but the most of them had too low a content of sugar and purity to be of any value for the manufacture of sugar.

ANALYSES OF BEETS AT THE AGRICULTURAL DEPARTMENT STATION OF MINNESOTA.

Prof. D. F. Harper, chemist of the station, has furnished me with the following analyses of beets made at that station.

The character of the beets for sugar-making purposes is fairly good:

Varieties.	Brix.	Sugar.	Purity.
	Per cent.	*Per cent.*	
Dippe's Vilmorin	17.10	14.01	81.93
Bult. Desprez's Richest	16.02	14.07	87.89
Simon Legrand's White Improved	17.60	14.83	84.26
Vilmorin's White Improved	15.00	12.17	81.13
Vilmorin	15.95	12.42	77.87
Gregory White Sugar	15.90	12.55	78.93
Lane's Improved	15.86	11.15	73.45
Vilmorin's White Improved	13.72	10.96	79.86
Dippe's Klein-Wanzlebener	15.92	13.04	81.91
Excelsior	15.55	12.26	78.84
Florimond Desprez's Richest	17.24	13.42	77.84
Improved Imperial	14.48	11.45	79.07

EXPERIMENTS WITH SUGAR BEETS AT TOPEKA, KANSAS.

Quite a quantity of beets was brought to the factory at Topeka, and an experimental run was made with them. The number of tons of beets used was 22. The juice from the samples of beets entering the battery was found to contain 15.36 per cent. of total solids and 9.30 per cent. of sugar.

It will be noted by the above figures that the quality of the beets was worthless for sugar-making purposes.

EXPERIMENTS WITH SUGAR BEETS AT MEDICINE LODGE, KANSAS.

In addition to the analyses and control of the sorghum sugar work extensive examinations were made of the beets growing in the locality of Medicine Lodge.

The season was a peculiar one for beets. At the commencement of the rains on the 28th of August the beets were scarcely at all developed and were regarded as a total failure. After the rains commenced the beets grew rapidly and continued to grow vigorously through the months of September and October. About the middle of November the harvesting of the beets was commenced and continued until December. At that time the beets had reached a fair size and developed a high content of sugar. Two hundred and sixty-one wagonloads were brought to the factory and large samples were taken from each of these loads and subjected to analysis. The means of 261 analyses follow:

In the juice.

Total solids	per cent	18.52
Sucrose	do	15.12
Purity		81.04

Four hundred and eleven miscellaneous analyses of the beets from different plots in the vicinity of Medicine Lodge were made with the following mean results:

In the juice.

Total solids	per cent	17.80
Sucrose	do	13.20
Purity		75.60

The fresh chips entering the battery had a mean sucrose content in the juice of 13.90 per cent, much less, as will be noted, than that represented by the analyses from the different loads.

The diffusion juices show a content of 10.45 per cent sucrose, and a purity of 81.2.

The working of the beets with the sorghum-sugar machinery was extremely slow, and either from this cause or from the method of liming, which was very heavy without any subsequent use of carbonic acid, the clarification and boiling of the juices became a matter of great difficulty, and they suffered in this process rapid deterioration; for instance, the purity of the clarified juice was only 78.8 and of the sirup 78.3, while the mean purity of the massecuites showed the enormous depression represented by the difference between 78.8 and 59.4. The actual cause of this remarkable deterioration in boiling is not well understood. The juices boiled with the greatest difficulty, it being almost impossible to prevent them from foaming in the pan. The semi-

sirups also, after standing for a time, deposited a large quantity of mucus or viscous material, and this would lead to the supposition that a pernicious fermentation of a viscous or mannitic nature was the cause of the great loss of sugar during the boiling operations.

It is evident at once that the attempt to make beet sugar without appropriate apparatus must be regarded as futile. Beets of the quality of those delivered at the Medicine Lodge factory, if they had been properly and promptly manufactured, would have yielded almost 250 pounds of sugar to the ton; instead of this the yield was extremely small, the separation from the massecuite very difficult, and the whole manufacturing process disappointing.

In regard to the probability of producing beets in the locality of Medicine Lodge, I am still of the opinion, expressed in Bulletin No. 27, that it is a locality too far south to expect the successful culture of the sugar beet. In using the term "too far south" it is not meant in an absolute sense, but too far south from the zone of the probable beet industry as indicated in the map given in Bulletin No. 27. The actual growing season at Medicine Lodge, it will be noticed, was not during the summer, but in the autumn after the rains fell and the weather had become cool. Had the early part of the season been wet enough to secure a growth of the beets it is hardly probable that they would have shown the high content of sugar which they did. The splendid results obtained at Medicine Lodge in the working of sorghum cane would seem to indicate the course which the sugar industry should follow in that locality. Everything indicates that the culture of sorghum sugar will prove a success while there is little to encourage the further development of the beet-sugar industry in that locality.

ANALYSES OF BEETS AT MEDICINE LODGE.

The following analyses show the character of the beets examined at Medicine Lodge during the months of November and December, 1890. As has been stated, the character of the season at Medicine Lodge was peculiar. On September 25 the beet crop was a total failure. Owing to the extremely dry summer the beets had not grown and were but little larger than a cigar. After that date copious rains with other favorable climatic conditions induced a rapid growth and produced by November a small crop of beets of exceptional richness in respect of sugar content. The data will illustrate in full the character of the juice of the beets. The general data of the season precede the details in the tables.

Analyses of beets—General data.

	Total solids.	Sucrose.	Purity.
Exhausted chips	1.20	.25	
Fresh chips	17.31	13.90	80.3
Diffusion juice	12.84	10.45	81.2
Clarified juice	13.65	10.80	78.8
Semi-sirup	43.00	31.95	78.3
Massecuite	86.90	51.64	59.4
Marc .... per cent..	5.11		
Press cake		1.53	
Extraction		98.1	
Dilution		27	
Sugar		87.0	
Beets worked .... tons..		293	
Harvested .... acres..		70	

Date.	Fresh chips.			Diffusion juice.			Clarified juice.		
	Solids.	Sucrose.	Purity.	Solids.	Sucrose.	Purity.	Solids.	Sucrose.	Purity.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*		*Per cent.*	*Per cent.*	
Nov. 23	17.33	13.90	80.37	12.80	9.71	76.02	13.63	9.93	73.02
24	17.03	14.20	83.52	13.03	10.11	79.82	14.07	12.43	*88.43
25	17.62	13.92	79.92	12.67	10.86	85.21	13.24	10.99	82.86
26	17.17	13.70	80.14	12.87	11.03	84.97	13.73	11.37	82.51
28	17.27	12.96	44.98	12.93	11.01	84.83	13.84	11.43	82.60
Dec. 2	18.09	14.11	78.39	11.99	10.22	85.43	14.00	10.67	75.72
3	17.03	13.96	81.81	13.00	10.30	79.11	14.07	10.68	75.69
5	17.00	13.97	81.83	12.97	10.67	82.21	13.82	10.99	78.92
6	17.25	14.38	83.16	13.31	10.14	76.82	12.45	9.38	75.23
Means	17.31	13.90	80.31	12.84	10.45	81.26	13.65	10.80	78.86

* Sorghum sugar melted in juice.

Date.	Semi-sirup.			Exhausted chips.		Press cake.
	Solids.	Sucrose.	Purity.	Solids.	Sucrose.	Sucrose.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*	*Per cent.*
Nov. 23	44.17	32.16	72.91	1.20	.23	1.62
24	46.19	41.19	*89.38	1.32	.30	1.57
25	42.11	29.11	69.98	1.16	.22	1.55
26	43.76	29.16	67.93	1.19	.22	1.42
28	44.11	31.11	70.55	1.27	.24	1.48
Dec. 2	39.24	29.12	74.28	1.22	.26	1.46
3	39.90	29.13	73.00	1.19	.24	1.49
5	42.27	30.11	71.32	1.22	.24	1.64
6	46.00	35.46	77.09	1.16	.30	1.54
Mean	43.00	31.95	74.30	1.20	.25	1.53

* Sorghum sugar added.

Date.	Massecuite.			Sugar. (sucrose)
	Solids.	Sucrose.	Purity.	
	Per ct.	*Per ct.*		*Per ct.*
Dec. 1	87.14	51.02	58.57	86.8
Dec. 8	86.70	52.26	60.27	87.2
Mean	86.92	51.64	59.42	87.0

	Per cent.
Marc	5.11
Extraction	98.1
Dilution	27.0

Miscellaneous analyses of beets.

[In the juice.]

Date.	Solids.	Sucrose.	Purity.	Description of samples from—
	Per cent.	*Per cent.*		
July 15	20.50	16.83	82.02	J. H. McCracken.
16	21.53	16.77	76.82	M. Best.
17	21.53	16.54	76.53	Hy. Hinze.
20	19.87	15.75	79.23	P. B. Cole.
24	18.90	15.20	80.43	George Heydenrick.
Aug. 1	14.50	9.45	65.33	Mullen; tops destroyed by web worms.
6	17.73	13.45	73.44	J. H. McCracken.
6	17.03	13.60	80.03	George Mawson.
9	14.20	10.81	76.11	Neligh, Nebraska.
Sept. 1	11.00	7.10	64.14	K. Lammerman.
1	17.10	12.87	74.90	Hy. Hinze.
1	15.63	11.95	76.25	S. B. Hunt; from middle of plot.
1	15.10	15.70	78.75	S. B. Hunt; from outside of plot.
6	15.23	11.14	73.52	Neligh, Nebr.
6	12.13	8.15	66.93	L. Clovis, Wanzlebener.
6	13.03	8.40	64.97	L. Clovis, Vilmorin.
10	15.03	11.25	74.70	George Mawson.
10	13.00	9.25	70.80	M. Best.
10	13.47	9.30	70.10	Do.
10	17.53	13.20	75.42	A. R. Moore.
11	15.83	11.60	73.40	T. Bennings, Wanzlebener.
11	16.00	11.80	73.80	T. Bennings, Vilmorin.
15	12.20	7.90	64.98	K. Lammerman.
15	14.17	11.95	83.39	W. W. S. Snoddy.
15	9.57	7.15	74.73	G. H. Moore.
15	14.17	8.20	58.16	K. Lammerman.
18	16.93	12.55	73.95	A. L. Duncan.
18	15.80	12.00	75.90	John D. Fleming.
18	16.00	11.15	73.62	O. Coyle.
20	13.80	9.45	68.11	W. Helget.
21	17.43	13.05	75.25	A. R. Moore.
23	17.80	11.05	60.72	J. H. McCracken.
25	17.67	9.10	55.02	Osborn.
25	17.37	10.40	60.18	E. Wennet.
25	17.63	9.95	57.69	Dobbs Bros.
25	15.87	8.90	55.39	L. Clovis, Wanzlebener.
25	17.03	9.83	56.86	Do. Vilmorin.
25	16.00	10.95	68.03	Mullen; tops destroyed by web worms.
27	18.37	11.75	63.85	W. Schmidt.
27	18.37	12.65	69.48	A. W. Smith.
27	18.63	12.25	66.30	George Heydenrick.
27	20.30	12.15	59.35	A. R. Moore.
27	18.07	12.60	69.27	Do.
30	17.87	10.95	62.21	C. H. Blackford.
Oct. 1	16.09	11.60	68.78	A. W. Smith.
1	18.10	13.05	72.10	Hy. Hinze.
3	21.43	16.85	78.00	J. H. McCracken.
3	18.63	12.55	67.64	W. Helget.
6	17.20	12.00	69.86	Osborn.
6	19.60	13.45	68.62	Do.
6	17.47	11.20	63.67	T. Bennings, Wanzlebener.
6	17.53	11.70	66.14	T. Bennings, Vilmorin.
6	17.80	10.70	59.92	J. B. Cool.
6	18.60	12.80	67.69	Rice.
6	18.37	13.90	74.01	A. W. Smith; dark ground.
9	17.54	13.60	78.70	O. Coyle; non-alkali soil.
9	15.83	12.05	75.90	O. Coyle; alkali soil.
9	17.80	12.75	71.20	A. L. Duncan.
12	15.10	11.70	78.75	J. H. McCracken.
12	17.37	12.75	73.99	P. B. Cole.
12	19.20	13.60	69.00	M. Best.
12	20.67	15.85	73.76	Do.
15	19.10	12.20	62.03	Hy. Hinze.
15	19.77	14.80	72.21	M. H. Sparks.
15	19.10	12.20	62.03	F. F. Mullen; tops destroyed by web worms.
15	16.87	10.80	63.26	Osborn.
15	16.83	10.55	62.16	J. D. Flemming; average size.
15	16.30	9.90	59.38	J. D. Flemming; large beets.
15	18.37	11.75	64.49	J. D. Flemming; small beets.
15	18.40	10.75	63.39	A. L. Duncan.
15	16.00	11.40	71.88	K. Lammerman.
17	17.83	11.15	63.13	Geo. Heydenrick.
17	18.60	11.75	63.51	Do.
17	18.17	12.15	66.00	W. Schmidt.
17	16.97	10.85	59.56	L. Clovis.
17	15.83	8.75	54.11	Do.
17	20.97	13.20	63.07	A. W. Smith.

Miscellaneous analyses of beets—Continued.

Date.	Solids.	Sucrose.	Purity.	Description of samples from—
	Per cent.	*Per cent.*		
Oct. 17	19.03	11.50	60.62	T. Bennings.
17	19.27	12.55	63.25	Do.
19	19.43	11.70	59.95	K. Lammerman.
19	17.80	10.70	59.92	Do.
19	19.40	11.95	61.31	S. B. Hunt.
19	17.67	11.70	66.14	
19	15.77	9.80	62.14	Rice.
19	17.50	11.20	63.67	Hartzell.
20	15.47	9.70	61.40	Dobbs Bros.
22	17.07	11.10	63.90	A. R. Moore.
22	20.47	11.70	54.66	J. H. McCracken.
22	17.67	11.35	64.43	A. R. Moore; roots.
22	17.80	10.95	62.21	A. R. Moore; tops of roots above ground.
22	18.58	11.70	58.41	O. Coyle.
22	20.30	12.15	59.35	J. D. Flemming; roots
22	17.57	11.00	62.75	J. D. Flemming; tops of roots above ground.
24	19.33	12.30	63.81	W. Welget.
24	18.50	11.60	61.44	Blackford.
24	19.07	12.25	64.77	F. F. Mullen; tops destroyed by web worms; new tops appeared.
26	17.77	10.55	59.30	Underwood.
26	18.50	11.85	64.05	P. B. Cole.
26	17.30	10.75	62.25	Geo. Mawson.
28	19.80	12.75	64.39	J. B. Cool.
28	19.03	15.85	83.19	Geo. Heydenrick.
28	19.09	12.55	64.92	J. H. McCracken.
28	19.77	12.90	65.66	Do.
28	18.67	11.40	61.72	K. Lammerman.
28	17.43	11.25	64.88	Do.
28	16.93	12.50	73.95	M. H. Sparks.
28	19.63	13.95	71.98	Hy. Hinze.
29	17.57	11.30	62.97	E. Wennet.
29	18.43	11.25	61.61	Do.
29	18.37	11.40	62.06	S. B. Hunt.
29	19.83	12.80	64.55	Dobbs Bros.
29	16.17	8.90	51.94	G. H. Moore.
29	19.78	13.05	63.95	Dobbs Bros.
30	18.46	11.90	64.69	Hartzell.
30	17.27	11.50	68.81	Do.
30	19.47	13.70	70.42	Blackford.
30	18.47	13.43	72.82	Do.
31	17.87	12.20	67.71	L. Clovis.
31	18.37	12.30	66.96	Do.
31	21.18	15.80	74.59	W. Helget.
31	19.33	12.80	66.22	P. B. Cole.
31	18.89	13.85	73.05	J. H. McCracken.
Nov. 1	19.47	14.20	73.70	O. Coyle.
1	19.47	13.70	70.42	J. H. McCracken.
2	17.47	13.75	78.73	M. Best.
2	19.19	13.35	69.56	Do.
2	19.88	13.95	71.98	Do.
3	19.86	14.25	71.38	Osborn.
5	19.40	14.40	74.23	Rice.
6	20.07	14.45	72.00	A. W. Smith.
6	19.97	15.55	77.76	Do.
6	21.00	15.75	75.00	W. Schmidt.
6	20.17	14.75	73.12	S. B. Hunt.
6	18.78	13.55	72.15	T. Bennings.
7	20.02	14.55	72.67	Do.
7	21.74	16.15	74.29	Geo. Heydenrick.
8	18.97	13.65	73.01	E. Wennet, tops.
8	19.27	14.55	75.50	E. Wennet, roots.
8	17.43	13.05	75.55	A. L. Duncan.
8	19.81	16.20	81.79	Do.
9	22.37	17.95	80.63	O. Coyle.
9	21.20	17.10	80.66	Do.
9	20.83	16.70	80.19	Do.
9	16.97	12.55	73.98	Scott Cummings, Canema, Kansas.
10	20.23	16.20	80.19	Mawson.
10	18.57	13.55	72.97	P. B. Call.
10	19.03	15.50	81.60	O. Coyle.
11	19.90	16.05	80.69	Do.
12	19.53	14.60	74.87	J. H. McCracken.
12	21.13	17.50	82.94	O. Coyle.
12	17.77	13.40	75.90	M. Best.
12	20.63	16.00	77.76	F. F. Mullen; had been injured by web-worms; new tops have appeared.
12	18.07	15.00	83.30	Do.
12	20.00	15.80	79.00	A. L. Duncan.

Miscellaneous analyses of beets—Continued.

Date.	Solids.	Sucrose.	Purity.	Description of samples from—
	Per cent.	*Per cent.*		
Nov. 12	20.70	15.35	74.10	O. Coyle; non-alkali soil.
12	15.80	12.00	75.90	O. Coyle; alkali soil.
12	17.80	12.75	71.28	Do.
12	17.93	14.70	82.10	O. Coyle; non-alkali soil.
12	19.60	13.65	76.45	Hunt.
13	19.63	15.90	81.12	Smith.
13	21.20	17.10	80.66	Do.
13	18.93	14.00	74.09	Rice.
13	20.23	16.95	83.91	Schmidt.
13	19.77	16.17	81.73	Do.
13	16.69	12.55	74.00	K. Lammerman.
14	19.47	14.65	75.26	J. H. McCracken.
14	20.83	16.45	79.09	Mullen.
14	18.77	14.30	74.87	Hy. Hinze.
14	19.53	14.60	74.87	M. Best.
14	19.83	15.25	76.76	Geo. Heydenrick.
14	20.40	15.80	78.30	Do.
14	18.73	14.40	77.00	P. B. Cole.
14	19.67	14.60	74.30	Mullen.
14	20.80	16.15	77.64	A. W. Smith, roots.
14	19.80	15.40	77.80	A. W. Smith, tops.
16	21.20	16.75	79.01	George Mawson.
16	15.47	11.90	77.90	K. Lammerman.
16	17.77	13.20	74.60	T. Bennings, Wanzlebener.
16	18.53	13.80	74.60	T. Bennings, Vilmorin.
17	18.59	14.30	78.40	Rice.
17	19.87	16.00	80.80	J. B. Cool, roots.
17	18.77	14.55	77.50	J. B. Cool, tops.
17	21.20	17.10	80.66	J. D. Fleming.
17	20.83	16.40	78.44	Do.
17	21.27	18.45	87.02	O. Coyle, non-alkali.
17	18.89	14.45	76.60	O. Coyle, alkali.
17	20.93	16.50	79.00	Beet pile.
17	15.10	11.70	78.75	K. Lammerman.
17	17.07	15.35	78.25	Beet pile, roots.
17	19.00	14.70	78.30	Beet pile, tops to above.
17	17.54	13.75	78.73	K. Lammerman.
17	18.03	14.10	78.35	Underwood.
18	17.47	13.75	78.75	Horn.
18	15.65	11.95	76.25	Beet pile, one yellow beet.
18	17.40	13.65	78.25	Beet pile, one very large beet, weight 7¼ lbs.
18	16.93	12.55	73.95	Rice.
18	18.77	15.40	82.40	A. W. Smith.
18	19.50	16.00	82.01	Do.
18	19.60	15.90	81.04	W. Schmidt.
18	17.82	13.65	76.45	Hy. Hinze.
18	18.27	13.50	74.18	A. R. Moore.
18	20.84	15.30	73.40	Do.
18	21.84	15.90	72.81	Blackford.
19	19.86	14.25	71.38	Osborn.
19	20.03	15.00	74.88	Beet pile, well shaped beets.
19	20.23	15.40	76.62	Beet pile, well shaped beets.
19	20.37	15.35	74.72	Beet pile, well shaped beets.
19	17.07	13.35	78.35	Beet pile, imperfect beets.
19	20.71	15.35	74.01	O. Coyle.
19	19.10	15.90	83.20	Do.
19	19.10	14.70	76.20	A. R. Moore.
19	19.77	15.60	49.20	J. D. Fleming.
19	18.21	15.90	86.90	Do.
19	21.73	17.25	80.00	W. Helget.
20	20.27	15.90	79.20	Beet pile, selected.
20	19.70	15.65	79.20	Beet pile, selected.
20	20.83	16.70	83.29	Geo. Heydenrick, selected.
20	21.77	17.65	81.33	A. W. Smith, selected.
21	17.80	12.75	71.28	Attica, Harper County, Kans.
21	17.36	11.25	68.40	Do.
21	21.33	16.70	78.40	O. Coyle, non-alkali soil.
21	19.23	14.40	75.00	O. Coyle, alkali soil.
21	17.77	13.90	78.53	Rice.
21	16.67	12.55	74.10	M. Best.
21	18.77	14.55	77.50	S. B. Hunt.
22	19.63	15.90	81.12	E. Wennet.
22	18.33	14.05	77.03	Do.
22	18.59	13.55	72.97	Hy. Hinze.
22	18.73	13.65	72.73	M. H. Sparks.
22	20.23	16.20	80.19	A. L. Duncan.
22	18.93	14.00	74.09	J. H. McCracken.
22	19.47	14.10	72.70	Do.
22	19.77	15.60	79.20	L. Clovis.

Miscellaneous analyses of beets—Continued.

Date.	Solids.	Sucrose.	Purity.	Description of samples from—
	Per cent.	*Per cent.*		
Nov. 22	20.93	16.50	79.00	Do.
22	18.89	14.45	76.60	Dobbs Bros.
22	21.27	18.45	87.02	A. W. Smith.
22	20.83	16.40	78.84	J. D. Fleming.
22	21.20	17.10	80.66	O. Coyle, non-alkali.
22	17.77	13.85	78.00	G. H. Moore.
22	18.07	14.10	78.35	Underwood.
22	18.33	14.60	79.80	Beet pile.
22	20.60	16.65	80.82	Do.
22	19.13	15.00	78.50	Do.
22	17.73	13.45	73.44	Do.
22	20.29	15.60	76.85	J. B. Cool.
22	18.70	13.80	73.79	Do.
22	22.00	16.80	76.36	Do.
22	19.00	14.90	78.40	Geo. Heydenrick.
22	18.27	13.50	74.18	T. Benning, large beets.
22	17.82	13.65	76.45	Do. do.
22	19.60	15.90	81.04	A. R. Moore, large beets.
22	19.50	16.00	82.01	A. R. Moore, small beets.
22	18.77	15.40	82.40	Mullen.
22	16.93	12.55	73.95	Mullen, very large beets.
23	17.40	13.65	78.25	Load, roots.
23	15.63	11.95	76.25	Load, top of root.
23	19.47	14.65	75.26	Do.
23	20.83	16.25	79.09	Load, root.
23	19.83	15.45	76.76	Do.
23	19.53	14.60	74.87	Load top of root.
23	18.77	14.30	76.45	Beet pile, large yellow beet.
24	20.93	16.40	78.00	O. Coyle, non-alkali soil.
24	19.70	15.65	79.20	O. Coyle, alkali soil.
24	20.40	15.80	78.30	J. D. Fleming.
24	20.30	15.00	78.70	Do.
24	19.00	14.25	75.25	Blackford.
24	20.80	16.15	77.64	E. Wennet.
24	21.77	17.65	81.33	W. Helget.
24	19.67	14.60	74.50	A. W. Smith.
24	20.17	15.55	77.60	A. R. Moore.
24	19.57	14.83	76.38	Mullen, roots.
24	18.23	14.00	76.90	Mullen, top of root.
24	19.33	14.80	76.70	J. H. McCracken.
25	20.83	16.70	80.29	Mr. Hinman, taken from pile.
25	18.70	14.05	74.88	Osborn.
25	21.70	17.40	81.31	W. Schmidt, high, red ground.
25	18.63	13.40	73.80	W. Schmidt, low, dark ground.
25	21.43	16.80	78.62	Hartzell, dark loam.
25	18.33	14.60	79.80	Selected samples, beet pile, roots.
25	17.77	13.45	73.44	Selected samples, beet pile, tops.
25	22.00	16.80	76.36	Selected samples, beet pile, roots.
25	20.29	15.60	76.85	Selected samples, beet pile, tops.
25	17.40	13.65	78.25	Selected samples, beet pile, roots.
25	15.63	11.95	76.25	Selected samples, beet pile, tops.
25	18.51	14.45	77.80	Selected samples, beet pile, roots.
25	17.69	13.25	71.26	Selected samples, beet pile, tops.
25	17.77	13.80	78.00	Selected samples, beet pile, roots.
25	15.88	12.00	78.00	Selected samples, beet pile, tops.
25	19.27	16.20	84.07	Selected samples, beet pile, roots.
25	20.70	15.35	74.01	Selected samples, beet pile, tops.
25	18.13	13.65	74.20	One large beet, A. W. Smith, weight 2 pounds 10 ounces.
26	17.80	12.75	71.28	Red and pink beets, pile.
26	20.93	17.35	82.81	Selected samples, pile, average weight 9 ounces.
26	19.63	15.90	81.12	Selected samples, pile, average weight 13 ounces.
26	19.77	15.60	79.20	Transplanted beets, Coyle.
26	21.17	16.70	79.14	Selected samples, load of Coyle.
26	21.57	17.25	80.23	Do.
26	18.83	16.15	85.90	Do.
26	21.23	18.35	86.93	Do.
26	22.22	16.10	72.49	Do.
26	21.12	13.50	63.91	Yellow beets, pile.
26	20.87	15.20	72.83	Mawson.
26	19.13	14.70	76.95	McCracken.
26	10.03	5.60	55.83	White table beet.
26	19.70	15.65	79.20	Pile, root.
26	18.73	14.40	77.00	Pile, top.
26	21.13	17.50	82.94	Pile, root.
26	20.40	16.35	80.14	Pile, top.
26	17.77	13.80	78.00	Pile, root.

Miscellaneous analyses of beets—Continued.

Date.	Solids.	Sucrose.	Purity.	Description of samples from—
	Per cent.	*Per cent.*		
Nov. 26	17.10	12.87	74.90	Pile, top.
26	19.73	16.10	81.63	Pile, root.
26	18.77	15.40	82.01	Pile, top.
26	20.23	17.00	84.20	Very perfect beets, pile.
26	20.65	16.85	81.77	Do.
26	21.33	17.00	79.40	Do.
27	22.00	16.05	72.95	Load, root.
27	19.51	14.60	74.87	Load, top.
27	19.47	14.10	72.70	Do.
27	21.80	16.05	73.62	Load, root.
27	18.89	14.45	76.60	Load, top.
27	18.97	15.03	79.40	Load, root.
27	18.57	14.50	78.40	Load, top.
27	19.90	15.70	79.30	Load, root.
27	17.77	13.20	74.60	Jackson.
28	22.76	18.50	81.50	Load, root.
28	21.63	17.45	80.60	Load, top.
28	19.81	16.20	81.79	Load, root.
28	19.70	15.65	79.73	Load, top.
28	18.03	15.00	83.30	Load, root.
28	18.20	14.15	77.98	Load, top.
28	18.03	15.00	83.30	Load, tops of root.
28	18.37	14.60	79.81	Load, roots.
28	21.07	18.40	87.62	Load, tops of root.
28	21.77	17.25	79.32	Load, roots.
29	20.03	15.80	78.88	Carload of beets from Newton, Kans.
29	13.63	8.10	59.69	Do.
29	19.69	16.70	83.40	Do.
29	20.30	16.20	79.89	Do.
29	20.40	15.70	77.09	Do.
29	18.40	14.20	76.83	Do.
29	18.88	14.00	74.03	Do.
29	18.30	15.50	84.70	Load, tops of root.
29	18.40	13.95	75.55	Load, roots,
29	22.37	18.40	82.51	Load, tops of root.
29	21.03	16.35	77.87	Load, roots.
29	21.60	18.30	84.72	Load, tops of root.
29	21.23	16.10	75.91	Load, roots.
30	20.13	16.40	81.60	Beet pile.
30	20.80	16.80	80.83	Do.
30	19.28	15.35	78.63	Do.
30	20.43	17.00	83.33	Do.
30	19.27	15.20	79.21	Do.
30	20.70	16.70	80.67	Do.
30	20.57	16.75	81.43	Do.
30	18.20	14.30	78.61	Do.
30	21.48	16.90	78.94	Do.
30	20.20	17.10	84.60	Do.
Dec. 1	13.70	8.60	62.77	Carload of beets from Newton, Kans.
1	15.03	9.80	65.33	Do.
1	15.03	10.60	70.66	Do.
1	15.47	10.60	68.83	Do.
1	15.60	9.20	59.00	Do.
1	16.43	12.40	75.60	Do.
1	13.47	8.60	64.19	Do.
1	14.35	10.00	69.09	Do.
1	16.10	11.60	72.05	Do.
1	15.57	10.80	69.23	Do.
1	18.77	13.65	72.73	Beet pile, root.
1	17.49	12.37	71.26	Beet pile, top of root.
1	19.37	15.40	80.30	Beet pile, root.
1	18.80	14.40	77.10	Beet pile, top of root.
2	20.83	16.73	80.32	Beet pile, root.
2	18.73	14.05	74.87	Beet pile, top of root.
2	19.90	15.05	78.31	Beet pile, root.
2	18.30	14.25	78.09	Beet pile, top of root.
2	19.73	15.60	79.11	Beet pile, root.
2	18.73	14.45	77.03	Beet pile, top of root.
4	23.07	19.30	83.91	Hartzell. Purchased by Department of Agriculture for seed.
5	23.00	18.65	81.52	Do.
5	25.27	20.79	83.79	Do.
6	23.40	19.45	82.70	Do.
6	22.37	17.95	80.58	Do.
6	25.83	21.80	80.62	Do.
Mean	18.92	15.19	79.83	
Maximum	25.83	21.80	86.90	
Minimum	11.27	5.60	54.11	

Load tests.

[In the juice.]

Date.	Solids.	Sucrose.	Purity.	Date.	Solids.	Sucrose.	Purity.
	Per cent.	*Per cent.*			*Per cent.*	*Per cent.*	
Nov. 14	17.77	13.85	78.00	Nov. 19	15.83	11.60	73.40
15	18.07	14.10	78.35	19	15.47	12.40	80.50
17	18.33	14.60	79.80	19	17.80	13.40	75.30
17	20.60	16.65	80.82	19	17.80	13.45	75.35
17	19.13	15.00	78.50	19	20.63	16.00	77.76
17	17.73	13.45	73.44	19	19.67	15.00	76.53
17	20.29	15.60	76.85	19	19.51	14.60	74.84
17	18.70	13.80	73.79	19	19.71	15.37	77.40
17	22.00	16.80	76.36	19	17.38	12.40	71.68
17	19.00	14.90	78.40	19	18.29	14.00	76.90
17	18.27	13.50	74.18	19	16.73	12.25	73.65
17	17.82	13.65	76.45	19	19.63	15.20	77.60
17	19.00	15.90	81.04	19	19.63	15.00	76.53
17	19.50	16.00	82.01	19	20.33	16.65	81.89
17	18.77	15.40	82.40	19	17.50	13.00	74.30
17	16.93	12.55	73.95	19	17.40	12.75	73.99
17	17.40	13.65	78.25	19	17.77	13.40	75.70
17	15.63	11.95	76.25	19	18.17	13.65	75.10
17	19.73	16.10	81.63	19	16.93	12.05	71.31
17	16.60	13.05	78.30	19	15.03	11.25	74.70
17	17.93	14.70	82.10	20	18.30	14.15	77.05
18	18.21	15.70	86.25	20	19.77	14.90	75.66
18	19.30	15.60	80.80	20	21.03	16.15	76.79
18	20.93	17.35	82.89	20	18.77	14.05	74.98
18	20.39	16.25	79.69	20	18.51	14.35	77.30
18	19.90	16.15	81.15	20	19.11	15.00	78.50
18	19.38	16.90	87.20	20	19.00	14.50	76.30
18	19.10	14.70	76.95	20	20.27	16.20	79.92
18	21.50	16.40	76.28	20	17.03	12.35	72.35
18	17.69	13.30	75.55	20	18.27	13.60	74.73
18	18.21	14.75	80.80	20	17.80	12.70	71.28
18	17.77	14.30	88.18	20	17.50	14.20	81.10
18	17.80	12.75	71.28	20	17.80	12.85	71.91
18	17.10	12.87	74.90	20	17.79	13.25	74.60
18	19.63	16.00	81.51	20	19.13	14.60	76.40
18	19.10	15.90	83.20	20	16.53	13.35	80.60
18	17.69	13.25	71.26	20	20.37	15.60	76.95
18	18.51	14.45	77.88	20	19.17	15.10	79.05
18	19.97	16.00	80.12	20	17.67	13.40	76.10
18	15.80	12.00	75.90	20	19.63	15.25	77.60
18	17.77	13.80	78.00	20	19.93	15.00	75.50
18	18.33	14.60	79.80	20	19.77	15.10	76.44
18	18.33	14.20	77.60	20	18.80	14.35	76.05
18	18.57	14.55	78.40	20	16.00	12.15	75.65
18	20.70	15.35	74.01	20	20.40	16.15	79.16
18	18.63	14.20	76.30	20	19.73	15.25	77.20
18	19.27	16.20	84.07	20	18.37	14.60	79.80
18	17.77	14.70	83.00	20	17.53	13.00	74.85
19	20.00	15.60	78.00	20	20.37	15.35	76.12
19	18.03	14.10	78.35	20	20.17	16.00	79.32
19	17.47	13.75	78.73	20	19.03	14.50	76.30
19	17.54	13.60	78.70	20	17.71	14.95	84.20
19	19.00	14.70	78.30	20	19.27	15.35	79.20
19	17.07	13.35	78.25	20	18.00	14.10	78.90
19	15.10	11.70	78.75	20	17.39	12.50	72.83
19	18.27	14.80	81.30	20	17.78	14.30	81.40
19	20.17	15.20	75.62	20	16.41	12.10	73.75
19	16.00	11.90	74.35	20	19.47	14.20	73.70
19	16.00	11.80	73.80	20	18.60	14.20	76.30
19	16.53	12.15	73.35	20	18.40	13.95	75.55
19	18.33	14.20	77.60	20	19.10	14.55	76.40
19	17.53	13.20	75.42	20	18.27	14.50	79.70
19	17.57	13.20	75.40	20	18.43	13.75	75.00
19	18.20	14.70	80.80	20	18.83	14.00	74.48
19	19.37	15.30	79.30	20	16.30	12.40	76.10
19	19.60	15.70	80.60	21	17.27	13.95	81.40
19	18.70	15.10	80.70	21	19.81	16.20	81.79
19	18.30	13.70	85.80	21	20.33	15.90	79.31
19	13.37	14.95	81.46	21	18.80	14.40	77.10
19	17.53	13.35	75.00	21	19.37	15.40	80.30
19	17.40	13.40	77.00	21	20.33	16.40	80.67
19	19.11	14.60	76.42	21	21.00	16.35	77.86
19	18.74	14.10	75.60	21	20.40	15.70	79.80
19	18.03	15.00	83.30	21	18.80	14.95	77.80
19	18.43	14.00	76.20	21	16.80	12.90	77.40
19	17.00	13.00	76.50	21	18.40	15.10	81.30
19	16.93	12.50	73.95	21	20.37	15.40	75.87

Load tests—Continued.

[In the juice.]

Date.	Solids.	Sucrose.	Purity.	Date.	Solids.	Sucrose.	Purity.
	Per cent.	*Per cent.*			*Per cent.*	*Per cent.*	
Nov. 21......	21.23	16.10	75.94	Nov. 24......	20.47	15.25	74.50
21......	17.47	12.37	71.26	24......	21.57	17.25	80.23
21......	18.77	13.65	72.73	24......	19.63	14.93	76.02
21......	19.87	15.80	80.30	24......	19.57	15.20	77.90
21......	17.43	13.05	75.25	24......	19.80	15.40	77.80
21......	19.27	15.10	78.65	24......	21.20	16.75	79.01
21......	17.20	14.75	85.45	24......	19.90	16.05	80.69
21......	21.80	17.15	78.67	24......	19.60	16.05	82.00
21......	18.90	14.00	75.16	24......	16.40	11.90	73.20
21......	19.30	14.80	76.70	24......	15.47	11.90	77.90
21......	20.00	14.80	74.00	24......	19.90	15.35	76.88
21......	19.00	13.70	72.66	24......	17.77	13.20	74.60
21......	19.00	14.25	75.25	24......	18.17	14.15	77.90
21......	20.80	16.15	77.64	24......	19.77	16.17	81.73
21......	21.77	17.65	81.33	24......	19.57	15.55	79.50
21......	19.67	14.60	74.50	24......	19.67	15.40	78.60
21......	20.17	15.55	77.60	24......	19.03	15.50	81.60
21......	19.57	14.85	76.38	24......	19.93	15.20	76.38
21......	18.23	14.00	76.90	24......	18.53	13.80	74.60
21......	19.33	14.80	76.70	24......	20.13	16.10	80.19
21......	20.83	16.70	80.29	24......	18.83	16.15	85.90
21......	18.70	14.05	74.88	24......	19.87	16.00	80.80
21......	20.00	15.90	79.50	24......	18.57	14.50	78.40
21......	20.00	15.45	77.25	24......	19.87	16.00	80.80
21......	18.63	14.00	75.27	24......	20.50	16.15	78.53
21......	19.03	15.85	83.20	24......	19.63	15.40	78.60
21......	18.23	13.75	75.80	24......	18.70	14.65	78.10
21......	19.91	14.90	75.20	24......	19.70	15.40	78.20
21......	19.49	14.60	74.87	24......	18.13	14.45	79.60
21......	19.59	14.60	75.26	24......	20.23	16.95	83.91
21......	18.29	14.20	78.00	24......	21.33	16.70	78.40
21......	19.89	15.05	78.30	24......	19.23	14.40	75.00
21......	21.39	16.25	76.29	24......	17.77	13.90	78.55
21......	18.19	14.10	77.90	24......	16.67	12.55	74.10
21......	16.63	14.30	86.15	24......	18.77	14.55	77.50
22	20.43	15.50	75.92	24......	19.63	15.90	81.12
22......	18.77	14.30	76.45	24......	18.33	14.05	77.03
22......	19.03	14.20	74.79	24......	18.57	13.55	72.99
22......	21.63	17.40	80.55	24......	18.73	13.65	72.73
22......	20.33	15.60	76.85	24......	20.23	16.20	80.19
22......	20.33	15.70	77.32	24......	18.93	14.00	74.09
22......	20.47	15.25	74.50	24......	19.47	14.10	72.70
22......	19.47	14.65	75.26	24......	19.77	15.60	79.20
22......	20.83	16.45	79.09	24......	20.93	16.50	79.00
22......	19.83	15.25	76.76	24......	18.89	14.45	76.60
22......	19.53	14.60	74.87	24......	21.27	18.45	87.02
22......	18.77	14.30	76.45	24......	20.83	16.40	78.84
22......	20.93	16.40	78.00	24......	21 20	17.10	80.66
22......	19.70	15.65	79.20	26......	20.73	16.60	80.00
22......	20.40	15.80	78.30	26......	21.03	18.00	85.71
22......	20.30	15.00	78.70	27......	17.83	13.40	75.30
22......	18.73	14.40	77.00	27......	21.37	17.90	84.03
22......	19.90	15.25	76.38	27......	20.10	16.65	82.83
22......	19.30	15.90	82.90	27......	19.00	15.30	81.00
22......	20.27	15.90	79.20	27......	22.00	16.05	72.95
22......	19.70	15.35	77.70	27......	21.80	16.05	73.62
22......	21.60	17.20	80.00	27......	18.97	15.05	79.40
22......	21.40	17.50	81.77	27......	19.90	15.70	79.30
22......	20.90	16.75	80.14	28......	20.00	15.80	79.00
22......	10.67	15.60	79.60	28......	22.76	18.50	81.50
22......	21.13	17.50	82.94	28......	19.51	16.20	81.79
22......	21.13	17.50	82.94	28......	18.03	15.00	83.30
22......	19.73	15.00	76.14	28......	21.07	18.40	87.62
23......	21.73	17.25	80.00	28......	24.37	19.50	80.25
23......	20.40	16.35	80.14	29......	18.30	15.50	84.70
23......	21.40	17.40	81.31	29......	22.37	18.40	82.51
24......	19.43	16.05	82.22	29......	22.37	18.40	82.51
24......	21.17	16.70	79 14	29......	21.60	18.30	84.72
24......	19.80	15.45	77.80	Dec. 1......	18.73	15.50	82.90
24......	20.43	15.95	78.18				
24......	16.37	12.95	79.80	Mean	18.52	15.12	81.04
24......	20.20	15.75	78.20	Maxims..	24.37	19.50	88.18
24......	19.83	15.45	77.80	Minims..	15.10	11.60	71.26
24......	19.17	14.50	75.91				

Composition of ash of beets grown at Medicine Lodge, Kansas.

DESCRIPTION OF SAMPLES.

No. of sample.	Description.	Grown by—	Kind of soil.
8432	Necks of beets Roots	Mr. Fleming	Upland red soil.
8433	Necks of beets Roots	O. Coyle	Bottom alkali soil.
8434	Necks of beets Roots Leaves	A. W. Smith	Bottom land; not alkaline.

Table of analyses of ash of beets and beet leaves, grown at Medicine Lodge, Kansas.

ASH, SOLUBLE IN BOILING WATER.

	Necks of 8432.	Roots of 8432.	Necks of 8433.	Roots of 8433.	Necks of 8434.	Roots of 8434.	Leaves of 8434.
CO_2	15.50	19.90	22.44	29.04	17.50	27.17	14.34
Cl	17.39	16.37	4.53	2.88	14.25	11.78	17.36
SO_3	7.76	2.66	10.17	5.02	10.49	1.97	12.72
P_2O_5	1.73	2.74	2.57	0.87	3.03	5.70	0.42
K_2O	46.95	45.79	57.52	61.90	51.10	50.30	41.33
Na_2O	11.57	13.22	2.87	2.45	6.92	3.05	18.65
SiO_2	0.88	0.30	0.50	0.30	0.20	0.20	0.35
CaO	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.	0.53
Total	101.78	100.98	100.60	102.46	103.49	100.13	105.70
Corrected for Cl	97.86	97.29	99.58	101.59	100.28	97.48	101.77

ASH, INSOLUBLE IN BOILING WATER.

	Necks of 8432.	Roots of 8432.	Necks of 8433.	Roots of 8433.	Necks of 8434.	Roots of 8434.	Leaves of 8434.
CO_2	4.07	6.36	8.28	7.99	6.95	3.95	3.37
SiO_2	36.74	19.21	23.56	12.49	35.96	9.31	55.86
Mn_3O_4	1.21	1.31	0.74	1.54	0.74	1.10	0.41
CaO	12.76	13.82	23.24	23.11	11.02	14.82	12.36
P_2O_5	7.66	10.74	14.48	16.03	16.81	20.10	6.59
MgO	22.58	38.27	21.44	37.53	15.51	38.28	15.01
Fe_2O_3	6.70	4.88	4.73	0.76	5.80	4.60	3.40
K_2O	5.60	3.30	2.07	1.22	3.05	4.35	3.20
Na_2O	2.54	1.50	1.04	0.33	2.25	1.63	1.95
Total	99.86	99.39	99.58	101.00	98.09	98.14	102.15

TOTAL, SOLUBLE AND INSOLUBLE ASH COMBINED.

	Necks of 8432.	Roots of 8432.	Necks of 8433.	Roots of 8433.	Necks of 8434.	Roots of 8434.	Leaves of 8434.
CO_2	12.07	17.19	16.33	23.67	14.07	21.32	9.35
Cl	12.17	13.05	2.90	2.15	9.60	9.26	9.41
SO_3	5.43	2.12	6.74	3.74	7.05	1.55	6.89
P_2O_5	3.51	4.36	6.58	4.74	7.52	8.78	3.31
K_2O	34.55	37.17	40.21	46.43	35.43	43.97	10.11
Na_2O	8.86	10.84	2.25	1.91	5.39	2.95	22.40
SiO_2	11.64	4.14	8.27	3.48	12.85	2.05	26.14
Mn_3O_4	0.36	0.27	0.25	0.39	0.24	0.24	0.14
CaO	3.83	2.81	7.83	5.89	3.59	3.15	6.03
MgO	6.77	7.77	7.23	9.57	5.48	8.19	7.02
Fe_2O_3	2.01	0.99	1.59	0.19	0.99	0.98	3.18
Total	101.20	100.71	100.18	102.16	102.21	102.44	103.98
Corrected for Cl	98.46	97.77	99.53	101.67	100.04	100.35	101.62

EFFECT OF SOIL ON BEET PRODUCTION.

Not only the climate but also the soil affects profoundly the quality of the beets grown. This is well illustrated by the experiment of Briem, published in Austro-Hungarian Journal of the Sugar-Beet Industry and of Agriculture, vol. 17, p. 571.

Briem chose two typical soils for a comparative trial, near each other, in order to secure identical climatic conditions. The mother beet from

which the seeds were obtained was a Vilmorin improved, which contained 19.86 per cent sugar. The seeds were planted in the two soils under precisely similar conditions and received the same culture. The one soil was very poor, with a gravelly subsoil. The other was a rich garden soil, on which a pond had once stood.

The beets which were produced were so different that even an expert would not have admitted that they came from the same seed. The poor soil gave a small beet, which soon reached the term of its vegetation, while the rich soil furnished a beet resembling those raised for forage and which at the time of harvest was still in full vegetation. A tabular view of the results is instructive:

Description.	Weight of root.	Sugar.
	Grams.	*Per cent.*
Mother beet	298	19.86
Beet from poor soil	160	14.57
Beet from rich soil	876	13.61

That a race of beets introduced into a new country develops new characteristics has long been known, but the above shows in a striking manner the part that the soil itself may take in these transformations.

CULTURE OF THE KLEIN WANZLEBENER ORIGINAL.

In a letter from the proprietors of the sugar factory at Klein Wanzleben, some interesting data have been communicated concerning the original Klein Wanzlebener beet, from which all the different varieties of this family have been derived. The methods of selection of beets for seed production are described as follows:

For the production of our beet seed, which is carried on by us exclusively, we use none but the full-grown beets, having never been able to satisfy ourselves with regard to the use of small beets. Although this method of cultivation would be much more profitable it has always appeared to us to be contrary to all laws of nature, and the seed from such imperfect beets is certainly more subject to degeneration than that from full-grown, mature beets. Variations of form can never be safely detected in these dwarf beets, while the mature beets are chosen with the greatest certainty by their external appearance.

The selection of the mother beets on the field and before siloing is made with the greatest care. Only those fields are used for this purpose which have been planted with seed from beets which were polarized and whose actual sugar content has been determined by the alcohol-extraction method. All beets which are defective in growth are rejected.

The process of selection commences in November, after all the beets have been harvested, and continues until the middle of April.

The work is carried on in three laboratories. In Laboratory I the beets are assorted by means of a solution of salt. About nine-tenths of all the beets reserved for seed selection are rejected in this laboratory, and only about 100,000 beets are transferred to Laboratory II.

The per cent of sucrose in the juice of these beets is now determined in Laboratory II by the polariscope, the figure thus obtained being always considerably reduced so as to allow for variations. The actual sucrose content of these polarized beets—daily about 150–200—is determined in Laboratory III by the alcohol method, so as to have a check on the polarization, and to avoid errors which might be caused by the presence of optically active bodies. Only those beets whose high sugar content is definitely proved by the last method are chosen for cultivation. These are again assorted, the finest specimens being planted in the spring for the production of extra fine seed. This seed, of which we can only furnish limited quantities, is therefore obtained from high polarizing beets without an intervening generation. We do not, however, consider that the careful selection of mother beets by their sugar content insures satisfactory results. If the choice of mother beets by polarization were the only condition necessary to obtain good results, every large estate would be able within a few years to raise a beet satisfactory in all respects. This is, however, impossible, as the beet is, more than any other plant, subject to sudden degeneration, which is explained partly by the history of its development and partly by insufficient transmitting of those qualities which distinguished the mother beet.

Very often external conditions, such as location and fertilization, exercise at times a deteriorating influence and cause a poor quality of beet, such as is not a natural variation of the family and is not hereditary.

For these reasons it is absolutely necessary, if we wish to raise a beet of constant high quality, to observe the experimental crops for a number of years, both as to their external appearance and chemical properties.

The fact that the beet is a biennial plant renders this method of selection proportionally more difficult.

The cultivation by families, together with the most conscientious individual cultivation, has been the foundation of our work for more than 30 years. It insures certain success to the growers of our original beet, an individual superior both in quality and quantity; in short, results such as the varieties introduced in Germany during the last ten years are unable to guaranty as the proof of their constant high quality, which can only be determined by careful observations extended over many years, is wanting.

As a transfer of the beet into other conditions of climate and soil may cause a deterioration in the second generation, the statement that the seed was obtained from our finest quality of beet is not a certain guaranty of success.

Some interesting data in regard to the operation of the sugar factory are also communicated, this being one of the companies which carries on both the manufacture of sugar and the production of sugar-beet seed. As will be seen from the data communicated the object is to produce not only a rich beet but one of large size, so as to secure as large a yield as possible of sugar per acre.

The data in regard to the operations of this factory follow:

[Sugar Factory Klein Wanzleben, successors to Rabbethge & Giesecke Stock Company at Klein Wanzleben.]

We beg permission to send the following data for general information concerning our house:

Our capital is 2,700,000 marks. Our stockholders are under no obligations to raise or furnish beets.

Our plant consists of a raw-sugar factory, which diffuses about 7,000 hundred-weight beets per day, and a molasses desucration factory, which is capable of working up about 1,000 hundred-weight of molasses. A large farming estate is connected

with the factory. The beet-sugar factory diffuses during the campaign about 500,000 hundred-weight beets. The yield in the campaign of 1890 was:

	Per cent.
First product	11.32
Second product about	1.40
Third product about	.20
Total	12.92

Our estate consists (excluding a large area which is planted with wheat, oats, etc.) of about 5,000 morgen of beets, both purchased beets and seed beets (4 morgen = 1 hectare; 1 English acre = about 1½ morgen).

The yield of 1889 was reduced by the poor results on certain strips of land, but nevertheless the average yield was 207.4 hundred-weight per morgen, some strips yielding as high as 234 hundred-weight. The crop of 1890 will yield about 200 hundred-weight per morgen.

A very important branch of our farm is the improvement of beet seed, which we have engaged in for the last thirty years.

The mother beets are chosen from the plats by careful methods of selection. In 1889–'90 we examined 2,782,300 beets, of which 3,043, that is, about one per thousand, were chosen for purposes of cultivation. The extensive work of selection occupies our experts from January to April, and visitors to our laboratories are always welcome. We are always pleased to give all information desired.

Our united farming and manufacturing interests soon proved to us the necessity of cultivating beets according to the yield of sugar per morgen, and we found the cultivation of our original Klein Wanzlebener beet, which unites a high yield per morgen with a high sugar content, as most profitable.

We desire to point out that we have adopted the name *Original* Klein Wanzlebener beet seed, as varieties of this beet have appeared of late which are offered under such names as "improved, containing a high percentage of sugar," etc., and which, in many cases, are not equal to the Klein Wanzlebener beet. The above name also provides a means of distinguishing between our original beet and these varieties.

We will be glad to furnish directions for the introduction of the beet, its cultivation, the methods of planting our Original Klein Wanzlebener beet, and samples of the seed.

KLEIN WANZLEBEN, *February*, 1890.

SYSTEMATIC STUDY OF THE DIFFERENT VARIETIES OF SUGAR BEETS IN SAXONY.

Professor Maercker of Halle has, for several years, collated the data in regard to the different varieties of sugar beets grown in Saxony; arranged in respect of their improvement in sugar percentage and in yield of sugar per acre. Nine reports have already been issued on this subject, containing data on all the different varieties of sugar beets grown in Saxony and especially on the different branches of the Vilmorin and Klein-Wanzlebener families of beets.

From Professor Maercker's ninth report the following table has been compiled, showing the character of some of the different varieties of beets investigated:

Comparative mean results of Professor Maerker's experiments in 1888.

	Sugar in the beet.	Sugar in the juice.	Purity quotient.	Yield of beets per acre.	Yield of sugar per acre.	No. of beets per acre.
Sugar beets of Vilmorin origin:	*Per ct.*	*Per ct.*		*Pounds.*	*Pounds.*	
Gebr. Dippe's zuckerreichste Élite	15.96	18.15	87.70	25,942	4,141	34,773
Heine-Emersleben verbesserte Vilmorin	15.70	17.81	87.70	27,702	4,349	33,894
Schreiber & Sohn Original	15.49	17.87	87.10	26,752	4,145	34,461
Knoche-Wallwitz, Vilmorin	15.48	17.90	88.23	29,128	4,509	34,677
Mette Vilmorin	15.37	17.67	87.80	27,262	4,189	35,254
Strandes Vilmorin	15.22	17.37	87.30	25,274	3,846	34,738
Schlitte-Aumühle Vilmorin	15.04	17.20	87.40	27,262	4,101	34,253
Grasshoff-Quedlinburg Vilmorin	14.82	17.05	88.40	28,019	4,154	34,482
Means	15.39	17.63	87.71	27,174	4,180	34,566
Sugar beets of Klein-Wanzlebener origin:						
Gebr. Dippe's verbesserte Klein-Wanzlebener Élite	15.55	17.89	88.75	31,698	4,928	34,909
Knoche-Wallwitz Klein-Wanzlebener	15.53	17.48	87.30	31,064	4,822	36,154
Kortum-Sondershausen Klein-Wanzlebener	15.44	17.61	88.20	28,670	4,428	34,525
Klein-Wanzlebener Original	15.38	17.44	88.73	32,965	5,071	35,163
Heine-Emersleben Klein-Wanzlebener	15.36	17.56	88.70	32,102	4,933	35,048
Neu-Querfurter Rübe	15.21	17.24	88.80	31,768	4,831	36,059
Grasshoff-Quedlinburg Klein-Wanzlebener	14.91	16.71	88.30	29,374	4,379	34,266
Braune-Biendorf Klien-Wanzlebener	14.85	17.01	88.10	32,894	4,884	35,446
Schreiber & Sohn Klein-Wanzlebener	14.71	16.62	87.80	33,686	4,956	37,200
Rimpau-Schlanstedt Klein-Wanzlebener	14.69	16.75	87.60	33,950	4,988	35,222
Wilke-Gr.-Möhringen Klein-Wanzlebener	14.56	16.67	88.20	33,422	4,866	35,170
Ziemann-Quedlinburg Klein-Wanzlebener	14.43	16.44	87.80	34,109	4,475	36,133
Strandes-Zehringen Klein-Wanzlebener	14.40	16.64	87.40	33,810	4,870	35,971
Means	15.00	17.08	88.13	32,278	4,836	35,482
Sugar beets of other strains:						
Bestehorn-Belitz Dividenden	15.15	17.88	87.70	28,670	4,344	34,936
Mette Specialität	14.78	16.60	87.70	32,877	4,859	34,955
Braune-Biendorf Kreuzung	14.71	16.90	88.04	33,264	4,893	34,912
Schlieckman-Auleben Specialität	14.38	16.35	87.80	33,352	4,796	34,349
Means	14.76	16.93	87.81	32,050	4,724	34,787

GENERAL CONCLUSION.

The result of the analyses at Grand Island and other places show that beets of high sugar content and great purity can be grown in many parts of the United States. The average size of the beets, however, in many places is too small to assume that their culture would prove profitable. It would be far better for all interests to grow beets averaging from 600 to 700 grammes in weight, even if the percentage of sugar should drop one or two points. The causes of the small crop at Grand Island have already been set forth, and it is not necessary to repeat them here. The Department has organized an experimental station for the culture of the sugar beet at Schuyler, Nebraska, and it is confidently expected that rich beets with high tonnage can be produced.

In a critical study of the data given above there are many points of interest. In judging of the character of a beet for sugar-making

purposes three factors must be taken into consideration. First of all, the beet must be large enough to make its growth profitable to the farmer. Experience has shown that a beet which weighs about 600 grammes, that is a little over 1 pound, is best suited to secure the interests of both the farmer and the manufacturer. Therefore, in all cases attempts should be made to grow beets as uniformly as possible of that weight. Having once established the average weight of the beet, the next point to be considered is its content in sugar. In the data given the percentage of sugar is reckoned on the weight of the beet itself and not upon the extracted juice. Sugar beets contain on an average about 5 per cent of marc and 95 per cent of juice. Therefore if the analysis is made upon extracted juice, the number obtained must be multiplied by 0.95 to give the percentage of sugar in the beet.

The question may arise as to how poor a beet can be in sugar and still be profitable for sugar making. This of course is a question which has to be determined by a comparison with many economic problems, the study of which can not be introduced at the present time. In general, however, it may be said that the limit of profit in manufacture will be reached when the percentage of sugar in the beet drops to 12, although it is possible under certain conditions for factories to work economically and profitably on beets having a lower percentage of sugar than that indicated.

With the present degree of perfection in the production of rich sugar-beet seed, and with the knowledge of the scientific principles of agriculture which should guide the beet-grower, it is possible, I think, to show that beets can be produced, under favorable soil and climatic conditions, which will contain on an average 14 per cent of sugar. The farmer, therefore, should not be satisfied if his results fall below this standard.

It will be easy to see, by comparing the averages given in the above tables, how many of the beet-growers have succeeded in growing plants which will average 600 grammes in weight and contain 14 per cent of sugar.

In addition to these two factors, however, a third must be taken into consideration, namely, the purity of the juice. By the purity of the juice, or, as it is expressed in the tables, the coefficient of purity, is meant the ratio of pure crystallizable sugar in the juice to the total solids therein. For instance, if in 100 parts of solids there are 80 parts of pure crystallizable sugar, the coefficient of purity of that juice is said to be 80. The number 80 may be taken as a fair average which should be attained in this country. In the older beet-growing countries a much higher degree of purity can be obtained than this. The degree of purity of the juice is influenced chiefly by the amount of salts which are represented in the analysis by the ash obtained on the ignition of the sample. In soils highly impregnated with mineral substances, such as are often found in our western countries, the percentage of ash will be

found very high, and there will be a corresponding depression of the purity coefficient. In lands, however, which have been long cultivated, and scientifically treated from an agricultural point of view, the percentage of ash in the beet will be diminished and the purity coefficient correspondingly raised. The ash of the beet consists largely of phosphoric acid and potash, and these two substances are essential to the proper growth of the beet. It is therefore not expected that the ash of the beet shall be reduced below a certain content, otherwise the growth and maturity of the plant will be retarded. It will not be possible in the space which is at our disposal here to discuss each of the series of data obtained by these analyses, but the above remarks are made for the purpose of enabling anyone who is interested in any particular series or analysis to discuss it intelligently and determine from the numbers given the value of the beets produced for sugar-making purposes. At the present time, for the purpose of fixing a standard of comparison, I would say that the typical sugar beet for sugar-making purposes should weigh 600 grammes, contain 14 per cent of sugar, and have a purity of at least 80. With such raw material at his disposal in sufficient quantity, the manufacturer can not fail of success, provided he be supplied with the latest and most improved forms of machinery.

It may also be of interest in connection with the data above given to discuss some of the particular qualities of the beet separately. In general the mistake is made by those not acquainted with the principles of the growth of the sugar beet and manufacture of beet sugar of judging of the possibilities of success by the percentage of sucrose in the beet alone. The danger of relying solely upon this constituent of the beet is at once manifest from the considerations above mentioned. Nevertheless, as it is often done, I have collected into tabular form from the analyses given all of the sugar beets showing from 15 to 18 per cent of sugar in the juice, which were analyzed by the Department at Washington during the past season. In another table have been collected all the beets in the juice of which more than 18 per cent of sugar was found. In the case of Minnesota 3 samples of beets were found in which the percentage of sugar was more than 18; in the State of Indiana, 1 sample; in Iowa, 1; in North Dakota, 4; in Maryland, 5; in Colorado, 1; in Wyoming, 1; in Nebraska, 13. Of beets showing a percentage of sugar from 15 to 18 in the juice the following numbers of samples were found: In Illinois, 3; in Minnesota, 15; in Nebraska, 36; in Maryland, 8; in Iowa, 4; in Wyoming, 2; in Colorado, 9; in North Dakota, 4; in Massachusetts, 1; in Wisconsin, 2; in California, 2; in South Dakota, 6; in Michigan, 4; in Kansas, 3; in Washington, 1; in Oregon, 2; in Virginia, 2.

The production of beets containing from 15 to 18 per cent of sugar is not unusual, and such beets may be regarded as strictly normal in constitution, but possessing a particularly high content of sugar. When, however, the content of sugar in the beet exceeds 18 per cent

it must be regarded at the present time as something abnormal and due to peculiar conditions affecting the particular locality, or even the particular plant itself. Such beets are usually extremely small in size, and the richness of their sugar content has been acquired at the expense of normal growth. In other cases the effect of a particularly dry season preceding the time of harvest or other very peculiar conditions may affect the sugar content. In many other cases, from the wilted condition in which the beets have been received, it must be admitted that a portion of the water which they contained has dried out between the time of harvest and the time of analysis, thus increasing the apparent percentage of sugar in the beet. It will doubtless be possible hereafter, when the beet has been more fully developed by careful selection, to produce beets normally which contain more than 18 per cent of sugar, but to expect at the present time the production of such beets on a large scale would be unreasonable, and such an expectation would not be realized. Even when we consider the other class, namely, those containing in their juice from 15 to 18 per cent, we must confess that it would be unwise to look for a production of beets on a large scale containing so large a percentage of sugar. In many of the cases of beets of this class the high sugar content must be ascribed primarily to some of the conditions mentioned for the class above 18.

When, however, the tables are further studied, and the remarkably low percentages of sugar are noticed which were sometimes found, it must be confessed that in these cases the abnormally low content of the sugar is also due to the abnormal growth of the beet. In some cases these beets are of abnormal size, weighing 2,000 grammes or over, and to this extraordinary growth must be attributed to a certain extent the low content of sugar. In general, it has been found that when beets exceed 600 grammes in weight it is difficult to maintain their sugar content at a high standard. When, therefore, the beets become immensely overgrown it is always accompanied with a falling off in content of sugar. In the cases, however, of the small beets which have shown a low content of sugar, the result must have been due to defective conditions of soil and climate, or to defective methods of planting and cultivation, or to premature harvesting.

When we consider the varying qualities of beets which have been grown from the same seed, we are at once struck with the immense importance of the factors of soil, climate, and cultivation, in the production of the sugar beet. In the fact that the seed of the Klein Wanzlebener variety of beet in the hands of different farmers will show a variation of from 6 to nearly 20 per cent of sugar, it must be confessed that we have in soil and climatic conditions, and in methods of cultivation, a more potent means of influencing the sugar content of the beet than is found in the germ of the seed itself.

It can only be expected that a sugar-beet seed which is high bred will be able to reproduce its kind when it has become fully acclimated and has received in its new condition the same scientific treatment and selection which it had in its original home. The great hope, therefore, of uniform production of sugar beets high in sugar-producing power in the United States must be found in the establishment of culture stations where different varieties of beets can become fully acclimated, and where they can receive the same careful scientific culture and selection which have brought them up to their present state of excellence in Europe.

APPENDIX.

NOTES ON SUGAR-BEET CULTURE IN FRANCE AND GERMANY.

By Walter Maxwell.

These notes are not intended to be a report upon the sugar-beet industries of France and Germany, nor in any measure a statement of the actual present condition of the sugar-growing industry of Europe, but rather as a short record of observations made during a tour through some parts of those countries, and more especially as a repetition of conversations held with certain distinguished authorities.

It will be found that the statements of several of the authorities have already been given in certain of the sugar journals, and are not new; however, it will be of value to repeat these opinions, and particularly in connection with the circumstances under which they were made.

The statements of the authorities cited were made in reply to precise questions, and I have endeavored to reproduce them exactly as they were given.

CLIMATE.

Prof. A. Girard, of the Conservatory of Arts and Industries, Paris, whose studies of the sugar beet are well known, made the following observations:

"The greatest number of our beet-sugar factories are established in that part of France extending from the center to the north and passing through the eastern provinces, where the climate is a temperate one; where the yearly amount of rainfall during the growing season is favorable to an even development of the beet, and where the summer lasts just long enough to mature the roots before the frosts set in. That part of France has been considered the best and the only part adapted to the cultivation of the sugar-beet. Until lately it has been held that beets could not be grown with any measure of success in the south of France, on account of the hot, dry weather which prevails during the summer and the heavy rains in autumn, which cause a second or delayed growth. That opinion has now changed, and two factories are well established in the south—Beaufort, Department de Vaucluse,

which produces 10,000 bags of sugar, and Laudun, Department du Gard, thus showing that with proper cultivation, fertilizers, and irrigation the culture of the beet in that part of France is also possible."

Respecting the action of climate upon beets and beet seeds grown in the north and in the south of France, respectively, M. Henri Vilmorin, Paris, said:"

"The influence of climate on the characteristics of the seed of a given variety of beet is not perceptible if only exerted for one year. We had seed grown from the same batch of stock-seed in the north and south of France, and no difference whatever was observed in the features of the roots. The seed from the south, however, was generally of a brighter color, drier, and of a slightly stronger growth."

Although it is held that given climates are specially adapted to culture of the sugar beet, in the words of Professor Girard "the results of more recent experiments, and particularly where the conditions of growth have been largely within experimental control, indicate that it must not yet be said where the beet can not be successfully grown."

SOIL.

"Is there anything to be added to or taken from the opinions of Chaptal, Vivien, or Basset in respect to the soils most or only adapted to the growth of the sugar beet?"

In reply to this question Girard said: "It would take a long time to detail all the kinds of soil which are or can be made suitable to the culture of the sugar beet, since with peculiar culture, the right fertilizers and chemicals, good beets may be grown wherever mangolds succeed. However, it is still held that the kinds of soil which are of a light rather than too compact a texture, containing a given amount of calcareous matters, or having a chalky subsoil, with good natural or artificial drainage, should give the best results. It is well known that fresh soils from old forests or virgin prairies, which are not only acid but also contain an excess of undecomposed organic matter, are unfit for the sugar beet. Lands on which sheep have been fed are likewise in an unsuitable condition to follow with beets for sugar purposes. But this, in some measure, depends upon the variety of beets to be grown. If a soil is full of nitrogenous matter it is, in general, not in a condition in which most beet varieties will grow and form sugar. It has been shown, however, that certain varieties will thrive in such unfavorable (generally) conditions, and this is a matter for special consideration."

Late in September of 1890 a visit was made to the farm and factory of MM. E. Dufay & Co., Chevry-Cossigny, Department of the Seine et Marne. The farm is comprised of some 700 acres, with an annual acreage of beets of about 170 acres. Contracts, which run on with a good understanding from year to year, are made with the large and well-to-do farmers in the immediate neighborhood, whose supplies bring

up the total annual acreage of beets worked by the Dufay factory to about 2,000 acres.

In the course of our conversation upon the nature of Chevry-Cossigny soils and of soils adapted to growing sugar beets, M. Dufay gave me the following data showing the relation of the clay and sand in the soils generally of his farms:

In 1,000 parts of soils.

Clay	707	674	673	629	681	658	680	609
Sand	292	326	327	371	319	340	320	391

M. Dufay said: "I consider a soil which is composed of about two-thirds clay and one-third sand to be well suited for the sugar beet."

But M. Dufay's knowledge of his soils was not limited to the relative amounts of clay and sand of which they are composed. He furnished some equally precise data showing the relative quantities of nitrogen, phosphoric acid, potash, and lime in the soils of his farms, whose clay and sand composition has been given:

In 1,000 parts of soils.

Nitrogen	.96	.97	.99	.94	.98	.80	.94	.83
Phosphoric acid	1.50	1.75	1.75	2.15	1.35	1.80	1.15	1.95
Potash	1.53	2.29	1.91	1.96	2.39	2.53	2.82	3.11
Lime	7.20	10.50	8.50	9.90	8.20	9.70	7.20	.50

M. Dufay said further: "A soil may be said to be well adapted chemically for the culture of the beet when the constituents spoken of are present in the following proportions:

"In 1,000 parts of soil—1 part of nitrogen, 1 part of phosphoric acid, 2½ parts of potash, 30 parts of lime.

"My soils are deficient in lime by two-thirds, and I have to add lime continually. The presence of constituents which act against the formation of sugar, such as the alkali salts, is too small to be observed."

CULTIVATION, FERTILIZATION, AND SEEDING.

With the general principles of cultivation of soils for growing sugar beets we are abundantly supplied on all sides. It is, though, of more interest and special value to know just how certain authorities manage, and what are their ways and methods, who are well known by their great success. It is specific knowledge that we want, and the actual facts from men who, during a length of years, have got great results.

Early in September I went over the farms of Messieurs Vilmorin, Audrieux & Co., at Verrières, near Paris. The farms comprise some 120 acres, which are exclusively used for horticultural and agricultural experiments.

Going over the plots, which were bearing the experimental sugar beets, I put some questions to the practical farm manager and care-

fully took his replies. These data should be of very special interest, as we are speaking of the actual management of the plot of the "Improved Vilmorin" for the year 1890, which is the latest in the series of trials dating from the year 1850.

"What is the soil of this plot, and does the soil vary much over your farm?"

The manager replied: "Just here it is a deep sandy earth and in places almost a sand. In other places it varies from a sandy to a heavier loam. We have no chemical analyses of our soils.

"Although the land lies flat, the natural drainage is in general enough; only in places has it been necessary to put in tile drains, as the beet does not require a dry earth. It is on the whole a dry surface soil lying upon a subsoil of more than average moisture."

"Now, how has this plot been cultivated from the first up to the present?"

"Last October the land was plowed to a depth of 10 inches, and after this plowing superphosphate of lime was added at the rate of 28 grams per square metre. After sowing the fertilizer the land was replowed, and to a depth of 16 inches, and left in that condition till the following April.

"At the latter part of April the land was replowed very deeply, scuffled, harrowed, and rolled until the soil was in a fine state, and the seed was put in."

"What was your mode of light cultivation?"

"As soon as the plantlets were out of the ground far enough to show the rows the hand hoe was used, not coming too near the plants. When the plants had four leaves the thinning out of the plants in the rows commenced. The plants were left 4 inches apart in the row at the first thinning. After the plantlets had grown so far that the roots were almost as thick as the thumb a second thinning took place, which left the plants as they stand—either 8 or 12 inches apart, according as it was determined. In the thinning process care was taken to leave the most promising plants.

"The ground was frequently hoed during the early season of growth to keep down the weeds and to open up and keep porous the surface. The hoeing was done exclusively by hand, no horse implement being used.

"If it is found, as it was this year, that the plants appear weakly, and the young leaves are of a yellow color, a second quantity of fertilizer is added, composed of equal quantities of superphosphate of lime and nitrate of soda, and at the rate of about 30 grammes per square metre.

"It is seen that no farm-yard manure was applied to the land for beets. Usually it is given to the preceding crop, in order that the excess of organic matter may be used up; yet a certain amount remains when the beets are planted. Our method of fertilization is usually as I have given it to you."

"What rotation, or rotations, do you follow with the land which is used for your seed beets?"

"Our mode of cropping is not a fixed one. This crop of 'mother' beets is growing after the following rotation of crops: 1886, beets; 1887, peas; 1888, wheat; 1889, potatoes (heavily manured); 1890, beets.

"Another rotation which has been followed is, beets, wheat, potatoes, peas, beets. In every case our rotation allows of three years of other crops between the crops of beets."

The practical example of cultivation which has been given applies to the growing of beets exclusively for seed or propagation uses. It will be of value to recite some notes taken from the system of a practical farmer and sugar manufacturer, whose beets were grown for factory purposes.

Dufay made the following remarks to my questions concerning his system of cultivation, fertilizing, and general management:

"Immediately after the harvesting of the grain crop where beets are to follow in the coming year, the ground is broken up about 4 inches deep with the plow, harrowed, and rolled with a 'croshill.' Almost immediately fine farm-yard manure is added, varying from 8 tons to 16 tons per acre, according to the known condition of the soil, and the ground is plowed to a depth of from 8 inches to 12 inches, and in this state left until the spring. I must here insist upon the need of deep plowing for sugar-beets. Where the less quantity of farmyard manure is used the deficiency is made up sometimes by the use of cotton-seed meal, applying about 1,000 pounds per acre, which is done in December, or at the time of deep plowing.

"In the spring, beginning even in March, we commence getting the seed bed ready. Since these operations depend solely upon the nature of the soil, the weather, and other circumstances, a direct rule can not be given. A practical man acts and does just what is best at the time, and a man who is not practical can not carry out a rule. But in a few words, in preparing the soil for the seed of the sugar-beet the end to be reached is to get the earth, chemically and mechanically, into a completely homogenous state; for only in this condition can we count upon a sure harvest of sugar-yielding beets."

In speaking somewhat in detail of the nature and quantity of artificial or chemical fertilizers which M. Dufay applies in addition to the farmyard manure mentioned, he furnished the following formula from his memoranda:

	A.	B.	C.
	Lbs.	*Lbs.*	*Lbs.*
Sup. phos. lime	1,000	750	1,500
Potass. chloride	625	425	425
Amm. sulphate	375	250	250
Nitrate of soda	850	375	375
Sulphate of lime	500	125	125
	3,350	1,925	2,675

The mean cost per acre of the quantities of these fertilizers is about 60 francs ($12).

The cost per acre of producing the year's crop was given as follows:

Farmyard manure	$28.00
Fertilizers	12.00
Spreading manure	.60
Spreading fertilizers	.25
First plowing	1.60
Harrowing and rolling after plow	.64
Plowing and subsoiling	4.60
Two scarifyings	2.00
Two harrowings	.64
Two rollings	.64
Cost of seed	3.00
Sowing of seed	.80
Harrowing and rolling again	.64
Three times hoeing with horse	2.40
Hoeing by hand	4.80
Harvesting by hand	4.00
Harvesting by machine	1.60
Carting to factory	2.40
Total	70.61

To the figures stated are still to be added the rent of land and taxes, $9.40, making a total of $80.01.

M. Dufay added: "The average per acre is from 12½ to 18 tons. The content of sugar year is 16 per cent of the weight of the beets and 17 per cent in the juice. If my crop averages in any year only 12 per cent of sugar in the beets, then it nearly pays the cost of production. Every pound above 12 per cent. is profit. This year we shall do very well. The only varieties of beets grown by me are the 'Improved Vilmorin' and 'Desprez,' and the seed is obtained each season direct from those firms."

The cost of production per acre given by M. Dufay is high. An approximate estimate of cost, expressed during conversation with a member of the Trotha Bros.' factory, Halle, Saxony, was lower; but the details were not given with such precision as to be worth stating. A general estimation of the cost per acre, furnished me by M. G. Dureau, Paris, though somewhat lower, was about the same as the figures in the Dufay statement.

The question of intensive culture, or high farming, which lies at the very root of success in sugar-beet growing, will be spoken of later and in connection with some other considerations.

SEED BREEDING.

In the course of conversation and communications with such authoritative sources as Messrs. Dippe Bros., Rickmann (formerly Rabbethge & Giesecke), and M. Henri Vilmorin, no very specific data were obtained which have not already been communicated through the journals. A

conversation, however, which was held with M. Henri Vilmorin, and which sets forth the principle and emphasizes the main features of the Vilmorin system of seed breeding, has a value that deserves to be repeated; and more especially in the light of the opinion and comments expressed by Professor Maercker, Halle, Saxony. Maercker said: "It must be admitted fully and by all that the Vilmorin firm had led the way in the improvement of the beet for sugar purposes. In the 'Improved Vilmorin' we had the first great representation of what could be done in the direction of increasing the sugar-forming quality of the beet."

M. Vilmorin spoke as follows: "The experiments for the improvement of the sugar-beet were commenced at Verrières in 1850, by my father. The object held in view was the formation and fixing of a race containing a higher per cent of sugar and a more even composition than the races then in use.

Several methods of selection were successively tried. First, dipping the roots in liquids of great specific gravities. This system was unreliable in the case of the whole roots in consequence of the presence of air cavities in the neck, which made some roots float which should have sunk; and in the use of small pieces or sections of beets fermentation of the liquids was induced, or strong endosmotic effects altered the results.

"Finally, it was found to be more exact to take a small cylindrical piece from the beet and to ascertain the specific gravity of the juice from the pulp. This was done by means of weighing a silver button in the juice. The roots were numbered in each individual and the richest in sugar kept for seed; and the same process was applied to the beets grown from the seed of the previously selected roots or 'mother beets.'

"The process stated was followed till 1872, and the 'Improved Vilmorin may be said to have been formed by that system of selection, the roots giving juice of the highest specific gravity being held to be the richest in sugar. The office of the polariscope is now added to the above process."

M. Vilmorin continued: "I consider it the most important point in the selection and growing of beets for seed that the roots be grown under such conditions that they freely and fully develop all their good and bad qualities. The system of growing beets for seed on very rich land, but very thickly together, is a great error, as this process hinders the formation of lateral roots, and at the same time greatly increases the content of sugar in the roots, so that they are made to appear of a better form and of a higher sugar quality than they really are. Now, in order to secure a perfectly just appreciation and proof of our 'Improved' beets, they are grown on exactly the same principle and by the same method as beets that are grown for the factory."

The method of cultivation and general management of the plot of "mother" beets on the Vilmorin farm is given on an earlier page, and exactly as received from the practical manager.

In speaking of the system of selection, M. Vilmorin continued:

"Only roots of perfect shape and weighing not less than 600 grammes are tested in the laboratory. Each single root is numbered, which number remains quite legible even after the root has been planted and borne seed.

"The seed of each individual root is harvested separately and kept by itself in a paper bearing the same number that was upon the root.

"The next year a trial is made with a small sample taken from each paper and the bulk of the seed is still kept back till after the roots grown from the sample have been tested.

"This is practiced as a precaution against the possibility of the progeny from a good beet falling far below the accepted standard of quality, which is a rare thing, but by no means unknown, even after long breeding in one line.

"After the previous test, all such beets as have not given satisfactory results are thrown away, and the seed from which such underquality beets were grown left unused. Of course the season and certain other circumstances have to be borne in mind in selections of each year, as in some years roots with 16 per cent of sugar may be relatively better than certain roots containing 20 per cent in some other years. To ascertain, however, the influence of the weather, some good lots of seed have been tested several years in succession and with a view to establishing the variation and error due to climate.

"All the seed that has been proved by the first year's test to be up to the standard of quality is sown the next year, and very thin and carefully, and from it a crop is grown more than a thousandfold the weight of the original seed.

"It is thus seen that any and all seed of the 'Improved Vilmorin' has come from stock-beets weighing not less than 600 grammes, all of which were for successive generations perfect in shape, color, proportion of sugar, and purity of juice; and only once has it occurred, and when the seed was grown for commercial use, that the seed was raised from beets of less size than 600 grammes.

"By the system of severe and unflinching constancy of selection that I have described to you, the 'Improved Vilmorin' beets have been brought to their present high standard of fixed economic qualities.

"The more marked characteristics of our beets are the hardness of flesh, which is at least equal to that of a Swedish turnip, the dull white and rough, rather smooth skin. The leaves, which are numerous, are strong and of a dark-green color, which, in the fall, like the foliage of most beets, droops down around the root."

SOME CHARACTERISTICS OF CERTAIN VARIETIES.

No effort was made to obtain information in general on the number, and constantly increasing number, of varieties which are being put upon the market. Our attention was directed only to one special characteristic, which is found to be the property of some varieties more than of others, viz, the capability of a beet to resist such unfavorable outward conditions of growth as climate, unfitness of soils for beets in general, in consequence of the presence of excesses of undecomposed nitrogenous matter. We shall give the statements of authorities direct on particular phases of this inquiry.

Franz Schindler, professor in Riga, said: "All the three types, Vilmorin's Improved White, Vilmorin's Early Rose, and the Improved (with Vilmorin) Klein-Wanzlebener, developed exactly their proper characteristics as well in Kwassiz, Moravia, as in the neighborhood of Riga, Russia, although the latter place is about a thousand miles farther north than the former. And all three types remained true not only in point of sugar content and other biological qualities, but also in anatomical structure. The climate of the two places is extremely different, and, moreover, the beets were grown in Kwassiz in an excellent beet land and under correct cultivation, while at Riga they were raised on a sandy soil rich in vegetable mold and largly manured with stable manure.

Now, it has been found by Deherain, in France, and also by Schindler and de Proskowetz in Russia that "the Vilmorin beets contain a higher proportion of fibrous to cellular tissue than any other types of sugar beets, and the amount of sugar being corelative with the fibrous tissue the higher sugar content is easily understood."

From notes sent by MM. Jacquemart and Delamotte, sugar growers and manufacturers at Quessy, Department Aisne, "beets of the 'Improved Vilmorin' were grown comparatively on the same field with doses of nitrogen amounting respectively from 37½ to 75 pounds per acre. The drought interfered with the action of the manure, but it was seen that the beets grown with the double allowance of nitrogen were of better quality than the others."

The value, respectively, of the types and kinds of beets is regulated by other conditions than the content of sugar—such as the production by weight per acre, etc. Professor Maercker said: "For a time the 'Improved Vilmorin' almost entirely substituted the Klein-Wanzlebener in Saxony on account of its high content in sugar. It has been found, however, that the 'Improved Vilmorin' does not produce the weight per acre, and has not succeeded as well with us under certain indifferent conditions as the Improved Klein-Wanzlebener. Consequently in our district (Halle and Magdeburg) the Improved Vilmorin has been replaced largely by a cross between the Improved Vilmorin and the Klein-Wanzlebener, which cross very specially combines the richness in sugar

of the former variety with the greater productiveness by weight of the Klein-Wanzlebener."

There are two fundamental economical conditions which control very largely the varieties of beets which shall be grown, in addition to the climatic and soil conditions, of which we have already spoken. Those conditions are: The system of taxation obtaining in each district or country. If the taxes are levied on the weight per acre of the roots, then it is specially advantageous to have the largest quantity of sugar contained within the smallest weight of raw produce or beets. If the tax is upon the manufactured product, the condition does not exist in the same form. The second fundamental condition regulating the variety of beets to be grown is devolving upon the consideration as to whether the beet crop is being grown exclusively for the sugar without secondary purposes, or whether the beet crop, as well as being grown as a direct source of profit in the form of sugar, is cultivated as part of a large and general rotation of cropping. Upon farms where live stock and the providing of food for such is an essential item in the economy, the difference between 20 tons and 35 tons per acre of beets is to the farmer a weighty consideration and often a decisive condition.

The substance of the observations made to me by many sound authorities on the relative and particular merits of respective varieties have inclined me to the following conclusion: As a variety for the highest and most concentrated production of sugar, for the withstanding of the unfavorable effects of certain climates and soils, and for use in new soils and such as are not habituated to the growth of the beet plant, no better beet can be adopted than the Improved Vilmorin. And again, as an all-round valuable beet, suitable to the farmer as a source of direct profit and as part of his system of mixed and general agriculture, as well as to the manufacturer of the sugar, the Improved Klein Wanzlebener is spoken of with unhesitating recommendations.

ECONOMICAL CONSIDERATIONS.

Many conversations were held with well-known authorities in France and Germany upon features of the sugar-beet industry that may be termed more specially economic. The substance of what was obtained will be given as the result of a conversation with Professor Maercker on some of the economic features of the industry. In conclusion will be given a conversation held with M. Tisseraud, permanent secretary of the department of agriculture of the Government of France.

Professor Maercker, in reply to questions, made the following remarks: "Owing to the very nature of the manufacture of sugar from beets, in which large and costly machinery plants are necessary, it is not possible for small owners or holders of land to grow beets and to make sugar therefrom on their own farms. The acreage of beets grown by such farmers individually could not pay for the investments necessary to the manufacture.

"There was only one of two courses by which it was possible to introduce beet culture among farmers generally, and as a great and general industry. The first method by which it could be done was by the farmers contracting with the large growers and owners of factories to grow a given acreage of beets and deliver the same to the factories under given conditions, as is the system in France. A second system was the uniting of the farmers among themselves and thus forming manufacturing companies (Actien Fabriken). The articles of these corporations or companies require that each member shall supply a given acreage or weight of beets to the factory, and according to conditions fixed upon by the board of control.

"With the founding of the latter system, which is the prevailing one with us, the growing of beets by the great farming class in the beet districts became solidly established. It was the opening of a new era of agricultural prosperity when the industry was made to prevail. The small owners and farmers, whose farms are comprised generally of from 50 acres to 120 acres, and quite exceptionally reaching 250 acres, became manufacturers of sugar as well as growers of the beets by accepting a direct interest in the owning and conducting of the factories."

In reply to the question "Have the owners of large private factories or the companies paid the best? And which system has done most for the industry?" Professor Maercker replied: "The undertakings of the large owners (gross Herren) are conducted with method and have the advantage of large capital, but there is not the degree of enterprise and care of detail characteristic of the companies (klein Herren) as represented by the farmers.

"The 'klein Herren,' being practical farmers, are well up in thorough and economical culture. They enter into the industry with the care and enterprise which their smaller conditions have always forced upon them; and as regards the technical or manufacturing part of the industry the companies composed of the farmers have shown an intelligence, ingenuity, and enterprise which has placed them in advance of their competitors of the 'large system.' The companies were the first to introduce improved methods of extracting the sugar from the beets, such as the diffusion method.

"Our farmers are in good circumstances, which have been improved with their general system of agriculture by the introduction of the sugar-beet industry. They are rich and free."

The German has most decided features of advantage over the French system. In Germany the growers of the beets are the manufacturers, and they reap a gain in the growth of the beet and the production of the sugar.

The system of farmers supplying beets under contract to large factories always places the growers at some measure of disadvantage; and where factories are large and isolated in wide districts, and the factory owners have little interest in the general agricultural interests, the result to the farmer may be, and is often, calamitous."

To M. Tisseraud, who is the permanent secretary of the department of agriculture of France, and who is not only conversant with the sugar-beet industry of France, but of whom it may be said that he holds French agriculture in his right hand, we have to express our obligations, not only for the general candor and copiousness with which he replied to our inquiries, but also for a very special politeness in causing certain data for the current year (1890), which had not at that time been published, to be furnished to us in manuscript.

The following observations were made in reply to certain carefully prepared questions which were put to the secretary in the order in which his remarks proceed:

"The very nature of the cultivation of the beet tends to make it an industry more adapted to growers, if not essentially on the large scale, at least who are not small in the sense that our peasants are, who cultivate from 5 to 10, or even from 20 to 30 acres. The culture of the sugar beet, if it is to be a success for the making of sugar, must be done well. The grower must be a man of capital, who can invest liberally per acre in the form of modern implements, of abundant labor, both manual and animal, at the right season, and who can purchase largely and with judgment of chemical manures, such as superphosphates. The soil must be plowed deeply and cultivated thoroughly, which means good implements and horses; it must be kept in clean condition, which means much labor; and it must be well fertilized with costly manures, which means a large outlay. Now, these conditions of the successful culture are not within the compass of our small peasant farmers. The larger farmers, *i. e.*, such as occupy enough land to bear investment in implements, labor, and manures, are capable of growing beets with as great success as the owners and holders (tenants) of the large tracts which exist in the districts where our sugar industry is making the greatest progress."

"What is now the tendency in France in respect to the 'large *vs.* small' system of beet culture?"

"The tendency is toward obtaining large tracts of land, where the heavy investments, in labor, implements, and manures, of which I have spoken, can be made most remunerative, and the facilities for manufacture of sugar are most complete. In the northern departments of France, where the culture is on the large system, the industry is expanding and gaining the most ground."

"What has been the effect of legislation upon the development of the sugar-beet industry, agriculturally, and also through the beet industry, upon your agriculture in general?"

"Before the year 1884 the farmers who grew beets to supply the factories had no interest in producing beets of high quality and with a large content of sugar. The law, as it at that time existed, made it most advantageous to the farmers to produce weight or quantity, as it was not merely the same to them in the price per ton that they ob-

tained. They also grew a much larger weight per acre for sale and had a correspondingly larger amount of pulp for feeding their cattle. The manufacturers, on the other hand, were being ruined by the operation of the law of that date. (See the law before 1884.) The law of 1884, however, altered these conditions. Under this law it became necessary to grow beets with a higher content of sugar, which not only were worth manufacturing, but which were found to be equally worth growing by the farmers, as the sugar factories were able to pay the growers $6 to $7 a ton instead of $4 to $5, as had been formerly paid. This change in the law affecting the sugar industry brought about the great improvement in the culture of the beet which has occurred in the last few years. In the first place, the improvement of the seed has taken the lead in consideration, and varieties have been produced and grown which were very rich in sugar. In the second place, the modes of cultivation have been improved and the application of chemical fertilizers increased up to the standard of the most intensive culture or high farming, all of which conditions are the essential factors of success in growing sugar beets."

"Are you of opinion that the successful growing of beets for a sugar-making purpose is only possible where 'intensive culture' or high farming obtains?"

"That is strictly the case. Sugar beets pay better than any other agricultural crop for high culture, and they can be made to pay only where 'high farming' is practiced. If you grow beets, grow the best that high culture can produce. Unless you farm well, have land in high condition, with liberal manuring and abundant labor, don't attempt to grow beets. Grow wheat, potatoes, or what you like, but don't grow beets. * * * We are not only increasing our productions in comparison with former periods, we are holding our place in competition with the world."

U. S. DEPARTMENT OF AGRICULTURE

DIVISION OF CHEMISTRY

BULLETIN No. 33

EXPERIMENTS

WITH

SUGAR BEETS

IN

1891

BY

HARVEY W. WILEY

Chemist of the U. S. Department of Agriculture and Director of the Department Sugar Experiment Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida; and Sterling and Medicine Lodge, Kansas

WITH THE COLLABORATION OF

Dr. WALTER MAXWELL, Prof. W. A. HENRY, and others

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Division of Chemistry,
Washington, D. C., February 27, 1892.

Sir: I have the honor to transmit herewith, for your inspection and approval, the manuscript of Bulletin No. 33, being a record of the experiments conducted by me, under authorization from you, on the culture of the sugar beet and the manufacture of sugar therefrom during the season of 1891.

Respectfully,

H. W. Wiley,
Chemist and Director of Beet Sugar Station.

Hon. J. M. Rusk,
Secretary of Agriculture.

EXPERIMENTS WITH SUGAR BEETS IN 1891.

The experiments conducted by the Department of Agriculture during the season of 1891 may be divided into three classes: (1) Culture of the sugar beet conducted by farmers in different parts of the country; (2) culture of the sugar beet conducted by the Agricultural Experiment Station of Wisconsin and numerous farmers in Wisconsin, under the direction of the Agricultural Experiment Station of that State, by authority of the Secretary of Agriculture; (3) experiments conducted at the beet-sugar experiment station of the Department located at Schuyler, Nebraska.

EXPERIMENTS CONDUCTED BY FARMERS IN DIFFERENT PARTS OF THE COUNTRY.

To meet the numerous demands for samples of sugar-beet seed received by the Department, 5½ tons of the best varieties of sugar-beet seed were purchased. Four tons of this consisted of equal portions of Kleinwanzlebener seed, grown by Dippe Brothers, of Quedlinburg, Germany, and Vilmorin's improved beet seed, grown by Vilmorin, Andrieux et Cie., of Paris, France. The other ton and a half consisted of Desprez, Lemaire, and Simon Legrand varieties, obtained from Mr. Henry T. Oxnard.

The beet seed was put up in packages averaging nearly 13 ounces each, making 15,000 packages. These were widely distributed, being sent to about 5,000 addresses. Many of those requesting several packages of seed made a subdistribution of them; so it is but fair to suppose that between 7,000 and 8,000 farmers received seed directly from the Department of Agriculture for experimental purposes.

Accompanying each package of seeds was a Farmers' Bulletin No. 3, containing full directions for the planting and cultivation of the beets. There were also sent to each one receiving a package of seed directions for taking samples of sugar beets for analysis and forwarding them to the Department. These directions were as follows:

DIRECTIONS FOR TAKING SAMPLES OF SUGAR BEETS FOR ANALYSIS.

U. S. DEPARTMENT OF AGRICULTURE,
Washington, D. C., July 1, 1891.

When the beets appear to be mature (September 15 to November 15, according to the latitude and time of planting) and before any second growth can take place, select an average row and gather every plant along a distance which should vary as follows, according to the width between rows:

From rows 16 inches apart, gather 75 feet; from rows 18 inches apart, gather $66\frac{2}{3}$ feet; from rows 20 inches apart, gather $59\frac{1}{5}$ feet; from rows 22 inches apart, $54\frac{3}{5}$ feet; from rows 24 inches apart, gather 50 feet.

The number of beets growing in the row, of the length above mentioned, must be counted. The tops are then to be removed, the beets carefully washed free of all dirt, wiped with a towel, and weighed. Where the row is not long enough to meet the conditions, take enough from the adjacent row or rows to make up the required length. The number of beets harvested multiplied by 435.6 will give the total number per acre. The total weight of beets harvested multiplied by 435.6 will give the yield per acre.

Rows of average excellence must be selected; avoid the best or poorest. Throw the beets promiscuously in a pile and divide the pile in two parts. This subdivision may be continued until there are about ten beets in a pile. Of these ten select two of medium size. Be careful not to select the largest or smallest. Wrap the beets carefully in paper and put your name thereon. Sew the beets up in a cotton bag, attach the inclosed shipping tag thereto, and send by mail.

Fill out blank describing beet, inclose in the envelope, and sew up in bag with beets.

No beets will be analyzed which are not sampled as described above and properly identified.

Miscellaneous analyses of samples without accurate description are of no value.

It is but just to the farmer and the Department that samples should be taken with the precautions required.

Blanks are sent to each one for two sets of samples. From two to four weeks should elapse between the times of sending the two sets of samples.

If additional analyses are required other blanks will be sent on application, but not more than four analyses can be made for any one person, except in special cases.

A model, showing how blanks should be filled out, is inclosed.

H. W. WILEY, *Chemist.*

There was also sent a blank for describing the samples taken, a copy of which, filled in, follows:

MODEL FOR DESCRIPTION OF SAMPLE OF SUGAR BEETS.

Variety .... Kleinwanzlebener.
Date planted .... May 2, 1891.
Date harvested .... November 5, 1891.
Character of soil...... black prairie loam; in cultivation for twenty years, chiefly in corn; level, tile-drained; last crop oats ....
Character of cultivation...... plowed November, 1890, eight inches deep, subsoiled six inches; dug twice with disk harrow May 1, 1889; rolled; seed planted with hand drill one-half inch deep; hoed by hand May 16; thinned May 29 and 30; plowed with horse hoe May 28 and June 8, 16, 24, and July 3; no fertilizers used ....
Width between rows .... 18 inches.
Number of beets harvested 88
Total weight of beets harvested .... 80 pounds.
Weather...... May, dry; June, copious rains; July, fine growing weather; August, hot and dry; September, dry until 24th, when a heavy rain fell ....
State .... Iowa.
Post-office .... Hanover, Buena Vista County.
Name .... Robert Simpson.

The samples of beets for analysis began to be received in the Department in August and continued to arrive until February, 1892. The total number of samples received for analysis, January 1, 1892, was 1,605.

It is therefore seen that of the 5,000 original persons to whom packages were sent over 32 per cent responded by sending samples for examination. As soon as each sample of beets was analyzed a return was made to the sender in the following form:

REPORT OF ANALYSIS OF SAMPLE OF SUGAR BEETS.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., October 24, 1891.

From Clarence Reed; post-office, Vernonia; State, Oregon; variety, Kleinwanzlebener; number, 2; serial number, 15838:

Average weight of beets: Grams, 275; ounces, 9.
Sugar: Per cent in beets calculated from per cent sugar in juice, 15.67.
Sugar: Per cent in juice, 16.5.
Yield: Tons per acre, 17.
*Coefficient of purity, 83.9. †Probable yield of sugar per acre from a crop of 17 tons: pounds, 4,036.

Respectfully,

H. W. WILEY,
Chemist.

One of the most striking features in regard to this method of conducting experimental work is found in the fact that it is almost impossible to secure compliance with directions. It is evident at once that the value of experimental work depends upon the care with which it is done and the accuracy with which the directions prescribed are followed. It is not to be wondered at that farmers, busy with their other occupations, failed to comply with the minute directions necessary to secure the greatest advantage in experimental work.

Very few of the blanks were returned properly filled out. In many cases the data which were returned were palpably erroneous. In one instance a yield of 99 tons per acre was reported, and in a great many cases the yield per acre was so great as to show inaccuracy on the part of the measurement of the land or the weighing of the beets. In making out returns for such reported phenomenal yields the theoretical quantity of sugar per acre given was always questioned. We are accustomed to look with suspicion upon any yield of sugar beets which exceeds 25 tons per acre. While it is not impossible to secure a higher yield than this, and of beets of good saccharine quality, yet it is so rare as to throw doubt upon miscellaneous data showing an excess of that yield.

Another point which makes the returns obtained less valuable is found in the fact of the length of time which necessarily elapsed between the harvesting of the beets and their reception at the laboratory.

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*The coefficient of purity is the per cent of sugar in the total solids of the juice of the beet.

†This number is only approximate, and shows the quantity of merchantable sugar which might be expected per acre from the yield, as reported by you, if manufactured by the best approved modern process.

Nearly all the samples received were from distant States, requiring for packages of this kind from three to eight days in the mails. Although the beets were in most cases well wrapped according to direction, our experiments have shown that they must have lost a considerable quantity of moisture by evaporation during their long transit. The data, therefore, showing the content of sugar in the juice would be uniformly too high for normal beets. It is estimated that not less than 10 to 15 per cent should in general be subtracted from the yield of sugar to express the normal percentage of sugar in the beets as originally harvested.

On account of the great number of samples received it was impracticable to determine the content of sugar directly in the beet pulp, either by cold instantaneous diffusion or by alcohol extraction. Recourse was had to the simpler method of calculating the quantity of sugar in the beet from the percentage of sugar found in the juice. This quantity was obtained by multiplying the percentage of sugar in the juice by 95 on the assumption that the beet contained 95 per cent of juice and 5 per cent of pulp. It is possible that, for the reasons above mentioned, this result is also too high, inasmuch as the beets having dried out would probably contain a larger percentage of pulp than that mentioned. At any rate the numbers give for all practical purposes the percentage of sugar which the beets contained and it was not intended that the analyses should be scientifically accurate. The comparisons among the beets received from different parts of the country must be considered just, with the exceptions before noted that some of them being longer in transit than others would suffer a greater loss of water. For this reason it would be expected that beets received from Washington and Oregon would show an apparently higher content of sugar than beets of equal original richness received from Maryland or Virginia.

The work of the Department has certainly resulted in great good in interesting people in all parts of the country in the problem of sugar-beet culture. The Secretary of Agriculture has, however, decided not to make as large a distribution of sugar-beet seed in the manner practiced during the past two years, but to concentrate his efforts in the development of a sugar-beet station, in which practical illustrations can be given of the very best methods of sugar-beet culture and the selection of mothers for the production of a high grade of seed.

In arranging the analyses of the samples of beets which have been sent in, they have been collected together by States and in the States by counties. The counties have been arranged alphabetically and all the samples from each county considered together and an average of the data from each county has been obtained. The averages for the States are made by samples, which gives the mean composition of all the beets in the State. In regard to the data by States it must be remembered that they can not be taken to represent actually the possibilities of each State in the growth of sugar beets. In the first place, the results of a single year

of culture, however carefully it may be conducted, could not be conclusive in regard to the possibilities of any one State or locality in the production of beets. In the second place, it must be understood that the farmers of different States may not have followed exactly the same method of sampling beets. In some of the cases, at least, where the general average of the State seems to run low it is found that the average weight of the beet was far above that which is required of a beet of high saccharine strength.

The results, therefore, must be simply regarded as tentative, showing in general where beets of fine quality can be produced, but not in any way deciding on the comparative ability of the several States for the production of rich beets.

The results of the analytical work arranged by States and counties are given in the following tables:

Summary of results by States and counties.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
					Per ct.	*Per ct.*	*Per ct.*		*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
	ARIZONA.											
15003	Josiah Harbert	Maricopa	Kleinwanzlebener	Aug. 12	16.03	7.10	6.75	44.4			1,415	50
15164	Charles D. Poston	do		Oct. 5	13.08	9.07	8.62	69.3			1,480	52
	Average of State				14.56	8.09	7.69	56.9			1,448	51
	ARKANSAS.											
16205	Ed. A. Scott	Crawford		Nov. 15	11.63	7.65	7.27	65.8			505	18
15002	Casper Raas	Sebastian	Belgian	July 24	11.20	5.80	5.51	51.8			1,740	62
	Average of State				11.42	6.73	6.39	58.8			1,123	40
	CALIFORNIA.											
15013	J. C. Merrill & Co	Los Angeles	No. 1	Sept. 3	16.13	13.23	12.69	82.0			2,400	85
15014	do	do	No. 2	Sept. 3	15.33	11.61	11.03	75.8			2,220	78
15020	D. Freeman	do	French	Sept. 11	13.22	8.90	8.35	67.3			1,760	62
15192	do	do	Kleinwanzlebener	Oct. 7	16.38	11.68	11.09	71.3	10.5	1,500	680	24
15736	do	do	do	Oct. 22	13.78	10.25	9.74	74.3	23.7	3,095	950	34
15649	A. Boelte	do	Vilmorin	Oct. 20	16.59	14.05	13.35	84.7	18.0	3,676	660	23
15737	James Cook	do	Kleinwanzlebener	Oct. 22	13.28	9.20	8.74	69.1	4.4	480	780	28
15021	do	do	do	Sept. 11	17.24	14.17	13.46	82.2			1,305	46
	Average of State				15.24	11.64	11.06	75.8	14.2	2,188	1,344	48
	COLORADO.											
15065	J. H. Tucker	Arapahoe	Kleinwanzlebener	Sept. 21	17.67	13.82	13.13	78.2			730	26
15066	do	do	do	Sept. 21	20.17	16.91	16.06	83.8			400	14
15067	do	do	Vilmorin	Sept. 21	17.97	14.49	13.76	80.6			840	30
15068	do	do	do	Sept. 21	20.07	16.16	15.35	80.5			260	9
15069	do	do	do	Sept. 21	18.47	16.16	15.35	87.5			610	22
15070	do	do	do	Sept. 21	19.87	15.85	15.06	79.9			500	18

15076	Jacob S. Yount	Arapahoe	Kleinwanzlebener	Sept. 23	17.53	12.70	12.06	72.4	....	....	990	35
15077	......do	......do	Vilmorin Improved	Sept. 23	19.03	14.96	14.21	77.0	....	....	990	35
15148	Wm. Claussen	......do	....	Oct. 3	15.43	11.94	11.34	77.4	....	....	640	23
16127	Henry Fitze, sr	......do	Kleinwanzlebener	Nov. 2	21.31	17.25	16.39	80.9	22.7	5,884	455	16
15502	H. H. Fisher	......do	French	Oct. 17	20.19	15.00	14.25	74.3	14.2	2,714	570	20
15503	......do	......do	......do	Oct. 17	18.39	13.66	12.98	74.3	14.8	2,546	860	30
	Average				18.84	14.91	14.16	78.9	17.2	3,715	654	23
15571	J. S. Johnson	Cheyenne	Kleinwanzlebener	Oct. 19	15.75	12.00	11.40	76.9	22.7	3,364	1,370	48
16299	Enos Plessenger	......do		Nov. 9	16.35	11.50	10.93	70.3	2.5	347	1,040	37
	Average				16.05	11.75	11.17	73.6	12.6	1,856	1,205	43
*15502	H. H. Fisher	Clear Creek	French	Oct. 17	20.19	15.00	14.25	74.3	14.2	2,714	570	19
*15503	......do	......do	......do	Oct. 17	18.39	13.66	12.98	74.3	14.8	2,546	860	28
	Average				19.20	14.33	13.62	74.3	14.5	2,630	715	25
15837	Chas. Hack	Costilla	Silesian	Oct. 24	19.17	15.60	14.86	81.4	....	....	1,145	40
15984	Geo. F. Breninger	El Paso	Kleinwanzlebener	Oct. 29	19.03	14.15	13.45	74.4	13.1	2,364	290	10
15376	......do	......do	......do	Oct. 14	19.37	13.97	13.27	72.0	11.3	1,950	285	10
	Average				19.20	14.06	13.36	73.2	12.2	2,157	288	10
16230	B. T. Wright	Huerfano	......do	Nov. 6	20.49	16.70	15.87	81.5	21.8	5,088	840	30
15414	Walter J. Quick	Larimer	Vilmorin	Oct. 15	18.67	15.70	14.92	84.2	17.0	3,856	440	16
16538	......do	......do	Lane's Imperial	Nov. 21	16.29	13.55	12.87	83.1	17.0	3,284	395	14
16300	C. S. Crandall	......do	Vilmorin Improved	Nov. 9	19.07	14.90	14.16	78.1	19.7	8,980	725	26
16301	......do	......do	......do	Nov. 9	20.77	17.85	16.96	85.9	11.1	2,917	445	16
16302	......do	......do	......do	Nov. 9	20.77	18.50	17.58	89.1	20.5	5,793	305	11
16303	......do	......do	......do	Nov. 9	20.97	19.50	18.53	93.0	15.2	4,727	180	6
16304	State agricultural station	......do	......do	Nov. 9	21.77	18.05	17.15	82.9	12.4	3,207	215	8
16305	......do	......do	......do	Nov. 9	22.17	20.00	19.00	90.2	19.8	6,126	360	13
15376	......do	......do	Kleinwanzlebener	Oct. 14	19.37	13.97	13.27	72.0	11.3	1,950	285	10
	Average				19.98	16.89	16.05	84.3	16.0	4,538	372	13
15413	Gus. Johnson	Logan	Bulteau Desprez	Oct. 15	17.35	11.90	11.30	63.6	14.0	1,957	550	19
15102	A. Nichols	Otero	Lane's Imperial	Sept. 26	8.30	4.32	4.10	40.0	....	....	1,640	58
15118	B. U. Dye & Son	......do	......do	Sept. 28	9.54	5.62	5.34	56.0	....	....	1,580	56
15193	G. A. Perkins	......do	Vilmorin	Oct. 7	15.78	12.35	11.93	78.2	10.5	1,739	180	6
15290	R. W. Mayne	......do	Kleinwanzlebener	Oct. 10	12.18	7.85	7.46	64.3	22.0	1,905	310	11
15377	F. L. Watrous	......do	Vilmorin	Oct. 14	17.67	14.25	13.65	80.5			505	18
15654	A. L. Kellogg	......do	Lane's Imperial	Oct. 20	10.58	7.70	7.32	72.7	....	....	1,420	50
15824	R. W. Mayne	......do	Kleinwanzlebener	Oct. 24	16.67	13.25	12.59	79.5	19.8	3,576	325	11
16367	F. L. Watrous	......do	Vilmorin	Nov. 13	18.69	15.20	14.44	81.3	10.2	2,280	795	23

* These two analyses were erroneously credited to this county.

Summary of results by States and counties—Continued.

COLORADO—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
					Per ct.	*Per ct.*	*Per ct.*		*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16416	Postmaster	Otero	Kleinwanzlebener	Nov. 14	15.85	11.10	10.55	70.0			335	12
16607	Geo. W. Swink	do		Nov. 30	21.03	18.10	17.19	86.0			1,070	38
16742	do	do	Vilmorin	Apr. 4	14.69	8.06	7.66	54.9			980	35
16743	do	do		Apr. 4	15.19	9.51	9.03	62.6			1,116	39
	Average				14.68	10.61	10.11	68.8	15.6	2,377	855	30
15048	C. M. Dille	Phillips	French	Sept. 19	16.11	12.02	11.42	74.6			1,360	48
15592	do	do	do	Oct. 19	15.55	9.30	8.84	60.0			2,490	83
15060	S. P. Richardson	do	Bulteau Desprez	Sept. 21	14.15	10.33	9.81	73.0			1,570	55
15474	do	do	do	Oct. 16	18.19	14.59	13.86	80.2			770	27
15061	C. G. Golter	do	Kleinwanzlebener	Sept. 21	17.05	11.92	11.32	69.9	14.8	2,115	1,470	52
15151	J. H. Zoll	do	Bulteau Desprez	Oct. 3	17.03	13.15	12.49	77.2			370	13
15504	do	do	do	Oct. 17	14.48	10.67	10.14	73.7			680	24
	Average				16.08	11.71	11.13	72.7	14.8	2,115	1,244	44
15942	Henry Holden	Yuma	Vilmorin	Oct. 27	22.24	18.70	17.77	84.1	4.6	1,211	120	4
15943	do	do	Kleinwanzlebener	Oct. 27	22.24	18.55	17.62	83.4	7.2	1,883	205	7
	Average				22.24	18.63	17.70	83.8	5.9	1,547	163	6
	Average of State				17.75	13.76	13.08	76.1	14.8	3,223	734	26

CONNECTICUT.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
15284	Theodore A. Stanley	Hartford	Kleinwanzlebener	Oct. 10	14.08	9.42	8.95	66.9	5.1	551	810	29
15285	do	do	Vilmorin Improved	Oct. 10	11.98	8.73	8.29	72.9	7.1	582	390	14
15696	Thomas J. Stroud	do	White Silesian	Oct. 21	13.11	10.45	9.93	79.7	25.0	3,570	640	23
	Average				13.06	9.53	9.06	73.2	12.4	1,568	613	22
16541	P. H. Peterson	Tolland	French	Nov. 21	16.31	13.1	12.45	80.3	17	3,067	1,080	38
16542	do	do	German	Nov. 21	17.31	15	14.25	86.7	17	3,757	840	30
	Average				16.81	14.05	13.35	83.5	17	3,412	860	34
	Average of State				14.56	11.34	10.77	77.3	14.2	2,305	752	27

GEORGIA.

15981	Edwin D. Newton	Clarke	French	Oct. 29	19.53	13.4	12.73	68.6			217	8
15982	do	do	German	Oct. 29	16.03	9.8	9.32	61.1			440	16
	Average				17.78	11.6	11.03	64.9			329	12

IDAHO.

16060	Geo. Yager	Alturas	Bulteau Desprez	Oct. 31	17.87	13.4	12.73	74.9			430	15

ILLINOIS.

15162	W. W. Kenney	Bureau	Vilmorin Improved	Oct. 5	20.41	16.11	15.30	78.9	10.7	2,330	440	16
16413	Palmer and Palmer	do	do	Nov. 14	14.95	11.15	10.59	74.6			1,590	56
16414	do	do	Kleinwanzlebener	Nov. 14	14.15	10.90	10.36	77.8			1,330	47
15291	R. H. Luckey	do	German	Oct. 10	13.18	9.25	8.92	70.0	12.0		1,270	45
16287	do	do	do	Nov. 9	14.35	10.50	9.98	73.2			1,650	58
	Average				15.41	11.58	11.03	74.9	11.4	2,330	1,256	44
16233	I. C. Eisenmayer	Clinton	German	Nov. 6	12.98	8.05	7.65	62.0			1,095	39
15828	Aug. Boehm	Cook	do	Oct. 24	16.37	13.00	12.35	79.9			1,230	43
15825	do	do	do	Oct. 24	17.97	14.75	14.02	81.8			1,230	43
15940	Jno. Miller	do	Vilmorin Improved	Oct. 27	17.54	14.80	14.07	84.3			1,310	46
	Average				17.29	14.18	13.48	82.0			1,256	44
16363	Arthur Chittenden	Cumberland	French	Nov. 13	17.59	13.15	12.49	75.3			1,257	44
15047	I. H. Gillum	Iroquois	Vilmorin	Sept. 19	13.41	9.87	9.38	73.6	17.4	2,267	700	25
15510	do	do	Vilmorin Improved	Oct. 17	13.58	9.55	9.07	70.3			870	31
15829	T. N. Marquis	do	Vilmorin	Oct. 24	16.97	12.28	11.67	75.2	24.8	4,092	460	16
16476	G. C. Smith	do	French	Nov. 17	16.37	12.75	12.11	77.9			1,150	41
	Average				15.08	11.11	10.56	74.3	21.1	3,180	795	28
15416	S. H. Weed	Henry	Kleinwanzlebener	Oct. 15	15.27	13.18	12.72	86.7	15.0	2,939	365	13
15417	do	do	Vilmorin	Oct. 15	17.37	14.25	13.54	81.7	13.7	2,736	430	15
	Average				16.32	13.72	13.13	84.2	14.4	2,838	398	14

Summary of results by States and counties—Continued..

ILLINOIS—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
					Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15138	George Leigh	Kane	Kleinwanzlebener	Oct. 2	14.58	12.04	11.44	82.6			1,020	36
15143	do	do	Vilmorin	Oct. 2	14.38	11.80	11.21	82.0			1,350	48
	Average				14.48	11.92	11.33	82.3			1,185	42
15003	A. Stayner	Knox	Vilmorin	Aug. 29	16.19	12.38	11.75	76.4			350	12
15023	do	do	do	Sept. 14	14.49	10.26	9.75	70.8			505	18
15161	do	do		Oct. 3	14.87	10.67	10.14	71.8			385	14
15121	do	do		Sept. 29	13.77	8.77	8.33	63.7			495	17
	Average				14.83	10.52	9.99	70.7			434	15
15941	L. Warner	La Salle	French	Oct. 27	11.82	8.50	8.07	72.0			1,860	66
15105	G. F. Hughes	Lee	Kleinwanzlebener	Sept. 26	19.96	15.32	14.55	76.8	9.8	1,726	275	10
15742	J. G. Fleck	do	German	Oct. 22	17.19	14.00	13.30	81.5			690	24
15743	do	do	French	Oct. 22	17.29	14.00	13.30	80.9			615	22
16242	Geo. S. Ransom	do	Kleinwanzlebener	Nov. 7	18.17	14.20	13.49	78.2			1,346	48
16385	Collins Dysart	do	do	Nov. 13	17.17	13.50	12.83	78.6	13.1	2,383	1,450	51
16386	do	do	Vilmorin Improved	Nov. 13	18.37	14.90	14.16	81.1	12.2	2,529	1,470	52
	Average				18.03	14.32	13.61	79.5	11.7	2,213	974	35
16647	Tony Schneider	McHenry		Dec. 21	20.17	15.88	15.00	78.6			765	27
15511	Eli C. Fisk	Mason	Vilmorin	Oct. 17	15.28	11.08	10.53	72.5			410	15
15512	do	do	German	Oct. 17	16.99	12.97	12.34	76.5			370	13
16587	do	do	French	Nov. 27	16.59	13.10	12.44	78.9			1,070	38
	Average				16.29	12.38	11.77	76.0			617	22
16056	Jacob Le Pere, jr	St. Clair	French conical	Oct. 31	17.25	12.80	12.16	74.1			520	18
15611	P. W. Mendenhall	Vermillion	Vilmorin	Oct. 19	16.05	12.00	11.40	74.5	24.2	3,710	460	16
16286	do	do	Kleinwanzlebener	Nov. 9	16.15	12.40	11.78	76.8	20.0	3,266	415	15
	Average				16.10	12.20	11.59	75.7	22.1	3,488	438	16
	Average of State				16.09	12.34	11.73	76.4	15.7	2,798	894	32

15059	Mary A. Lorts	Bartholomew		Sept. 21	13.15	9.01	8.51	68.5			1,200	42
15137	Wm. Schlusemeier	do	French	Oct. 2	11.78	9.17	8.71	77.8	6.1	745	520	18
15593	do	do	do	Oct. 19	14.35	9.65	9.17	67.2	6.1	677	460	16
16284	do	do	do	Nov. 9	13.15	9.0	8.55	68.4	6.1	644	410	14
15144	T. W. Barriger	do		Oct. 2	14.38	11.47	10.90	79.8			500	18
15597	S. P. Snyder	do		Oct. 19	14.15	10.2	9.69	72.1			1,080	38
15598	A. J. Thomas	do	Vilmorin	Oct. 19	17.27	13.3	12.63	77.0			520	18
15176	Jas. Talkington	do		Oct. 6	11.55	7.65	7.26	66.2			550	19
15902	do	do		Oct. 26	14.95	10.60	10.07	70.9			460	16
	Average				13.86	10.01	9.50	72.0	6.1	689	633	22
15088	J. M. Snodgrass	Clinton	Vilmorin Improved	Sept. 24	16.56	13.93	13.23	84.1	11.6	2,311	640	23
15652	do	do	Kleinwanzlebener	Oct. 29	17.39	14.65	13.92	84.2	12.3	2,595	530	19
	Average				16.98	14.29	13.58	84.1	11.9	2,453	585	21
16359	Geo. L. Bunker	Decatur	Kleinwanzlebener	Nov. 13	18.49	14.2	13.5	76.8			245	9
16360	do	do	do	Nov. 13	16.87	12.0	11.40	71.1			390	14
	Average				17.68	13.1	12.45	73.95			317	12
15103	Samuel Harper	Grant	Kleinwanzlebener	Sept. 27	15.94	12.13	11.52	76.1			670	24
15289	John Sherman	do	do	Oct. 10	14.78	11.64	11.05	78.6			965	34
15356	Abraham Daniels	do	German	Oct. 13	15.42	11.70	11.11	76.0			1,460	52
15357	do	do	French	Oct. 13	12.42	9.49	9.01	76.5			1,470	52
15358	Jacob Apple	do	German	Oct. 13	13.02	9.78	9.30	75.2			535	19
15359	Geo. Weisenbarger	do	French	Oct. 13	13.42	10.10	9.69	75.4			1,065	37
15360	Wm. Gowin	do	German	Oct. 13	14.12	11.57	10.98	82.0			655	23
15361	Stephen M. Gowin	do	French	Oct. 13	13.12	8.58	8.15	65.3			1,010	36
16577	Jno. S. Pence	do	German	Nov. 27	14.88	11.8	11.21	79.3			970	34
16578	Isaac Gentis	do	do	Nov. 27	15.38	12.5	11.88	81.3			1,960	69
16579	T. J. Creviston	do	do	Nov. 27	15.59	13.0	12.35	83.3			610	22
	Average				14.37	11.12	10.77	77.2			1,034	37
15079	F. B. Pfaff	Hamilton		Sept. 23	13.21	9.64	9.16	73.0			2,180	77
16234	do	do		Nov. 6	18.19	14.0	13.35	76.9			685	24
16235	do	do		Nov. 6	15.98	12.0	11.40	75.1			725	26
16460	do	do		Nov. 16	16.25	11.6	11.02	71.4			303	11
15987	L. F. Nordyke	do	Bulteau Desprez	Oct. 29	15.03	11.8	11.21	78.5			1,760	62
16241	do	do	do	Nov. 7	16.67	13.15	12.49	78.9			1,670	59
	Average				15.89	12.03	11.44	75.6			1,221	43
15189	E. Steltzer	Henry	French	Oct. 7	16.29	13.93	13.23	85.5			340	12
15190	do	do	Kleinwanzlebener	Oct. 7	17.09	13.90	13.20	81.7			410	14
	Average				16.69	13.92	13.22	83.6			375	13

Summary of results by States and counties—Continued.

INDIANA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15733	F. W. Baker	Howard	German	Oct. 22	15.28	11.25	10.69	73.5	....	....	1,025	36
16122	Gurney Lindley	do	Kleinwanzlebener	Nov. 2	15.59	11.50	10.03	73.1	16.8	2,423	970	34
16283	Robt. Massey	do	do	Nov. 9	14.65	10.25	9.74	70.0	....	....	1,680	59
16644	E. E. McLane	do	do	Dec. 21	18.77	15.42	14.65	82.1	....	....	780	28
	Average				16.07	12.11	11.28	74.7	16.8	2,423	1,114	39
15321	H. H. Grissom	Jay	German	Oct. 12	14.68	10.78	10.24	73.4	18.7	2,536	425	15
16397	T. L. Stratton	do	do	Nov. 14	21.17	17.60	16.72	83.1	12.2	3,060	575	20
15086	C. H. Holly	do	do	Sept. 24	16.54	12.16	11.55	73.5	18.9	2,895	600	21
16643	do	do	do	Dec. 21	17.47	13.47	12.81	77.0	19.6	3,489	550	20
	Average				17.47	13.50	12.83	76.8	17.4	2,995	538	19
15178	E. S. Carter	Johnson	French	Oct. 6	13.85	10.55	10.2	76.1	6	826	980	35
15115	Lewis Krepper	Kosciusko	Vilmorin Improved	Sept. 28	16.39	13.13	12.47	80.1	24	4,330	745	26
15320	Jno. Frazier	do	Kleinwanzlebener	Oct. 12	15.78	10.89	10.35	69.0	....	....	710	25
15382	J. M. Smith	do	Vilmorin	Oct. 14	17.47	14.73	13.89	84.3	....	....	530	19
15476	T. L. Hammond	do	Kleinwanzlebener	Oct. 16	12.48	11.21	10.65	90.0	....	....	1,550	55
15594	A. T. Cook	do	French	Oct. 19	15.85	13.00	12.35	81.9	19.6	3,579	240	8
15595	Peter Edler	do	Lane's Imperial	Oct. 19	13.95	9.60	9.12	68.8	....	....	760	27
15596	Frank Bartz	do	Vilmorin	Oct. 19	14.45	11.35	10.78	78.50	22.9	3,499	645	23
15651	E. F. Diehl	do	do	Oct. 20	17.69	14.65	13.92	82.80	4.4	884	290	10
15653	F. G. Bent	do	German	Oct. 20	15.28	11.95	11.35	78.2	18.5	2,955	355	13
15734	H. H. Dorsey	do	French	Oct. 22	16.29	13.00	12.35	80.0	....	....	560	20
16055	Nicolas Cook	do	do	Oct. 31	18.97	15.70	14.91	78.6	....	....	595	21
16285	H. H. Johnson	do	Vilmorin Improved	Nov. 9	16.15	12.20	11.59	75.6	6.2	980	975	34
16415	John Catey	do	Kleinwanzlebener	Nov. 14	20.77	15.80	10.3	76.1	22.9	4,733	420	15
16564	S. D. Anglin	do	do	Nov. 24	15.89	12.80	12.16	86.7	....	....	1,430	51
16565	do	do	Vilmorin	Nov. 24	16.01	12.75	12.11	80.5	....	....	1,060	37
15598	A. J. Thomas	do	do	Oct. 19	17.27	13.30	12.63	77.0	....	....	1,080	38
	Average				16.09	18.88	11.93	79.5	16.9	2,994	747	26
15735	J. Haines	Madison	Vilmorin	Oct. 22	17.29	14.25	13.54	82.3	7.8	1,569	370	13
16583	Robt. C. Smith	Montgomery	Kleinwanzlebener	Nov. 27	16.79	13.30	12.64	79.1	....	....	580	21
15080	James Powell	Perry	Vilmorin Improved	Sept. 2	14.54	11.34	10.77	78.0	17.9	2,484	1,030	36

15399	......do	......do	Kleinwanzlebener	Oct. 15	15.55	9.36	8.89	60.0	....	....	500	18
	Average				15.05	10.35	9.83	69.0	17.9	2,484	765	27
15477	Jos. W. Mills	Randolph	German	Oct. 16	14.58	11.28	10.72	77.4	....	....	830	29
15478	Jacob M. Barker	......do	French	Oct. 16	14.68	11.34	10.77	77.6	....	....	750	26
	Average				14.63	11.31	10.75	77.5	....	....	790	28
15132	C. A. Porter	Shelby	Kleinwanzlebener	Oct. 1	15.65	11.81	11.22	75.4	....	....	870	31
15501	......do	......do	......do	Oct. 7	15.38	11.34	10.77	73.7	....	....	1,080	38
16282	......do	......do	......do	Nov. 9	17.77	14.15	13.44	79.7	....	....	620	22
	Average				16.27	12.43	11.81	76.2	....	....	857	30
15831	Mrs. T. C. Bailey	Tippecanoe	Bulteau Desprez	Oct. 24	14.75	11.50	10.93	77.9	....	....	510	18
16443	Frederick Haupertz	Wabash	Kleinwanzlebener	Nov. 16	18.23	15.70	14.92	86.0	....	....	880	31
16444	......do	......do	......do	Nov. 16	13.73	12.50	11.88	91.1	....	....	383	14
16496	W. H. Bent	......do	German A	Nov. 19	17.53	14.60	13.87	83.3	....	....	1,210	43
16497	......do	......do	German B	Nov. 19	17.53	14.60	13.87	83.3	....	....	1,230	44
16498	Warren Bigler	......do	French A	Nov. 19	20.03	12.0	11.40	59.9	....	....	1,040	37
16499	......do	......do	German B	Nov. 19	15.83	11.3	10.74	71.4	10.3	1,996	670	24
16554	Banner McCowen	......do	......do	Nov. 23	18.91	14.0	13.30	74.0	....	....	610	20
16555	......do	......do	......do	Nov. 23	23.54	18.5	17.58	70.1	13.5	1,501	440	16
	Average				18.17	14.15	13.45	77.4	11.9	1,749	808	30
15380	George R. Clayton	White	Vilmorin	Oct. 14	18.37	14.52	13.79	79.0	19.8	4,380	625	22
15381	......do	......do	......do	Oct. 14	19.47	15.40	14.63	79.6	14	2,899	405	14
	Average				18.92	14.96	14.21	79.3	16.9	3,640	515	18
	Average for State				15.97	12.32	11.64	76.9	14.0	2,416	794	27

INDIAN TERRITORY.

16580	Arthur E. Wilson	Chickasaw	Kleinwanzlebener	Nov. 27	15.99	13.05	12.40	81.6	20.9	3,816	1,215	43

IOWA.

15273	M. Geide	Allamakee	French	Oct. 10	14.2	11.0	10.5	77.7	....	....	1,685	59
15274	......do	......do	German	Oct. 10	15.0	11.0	10.5	73.3	....	....	1,630	58
15634	Enoch Miller	......do	French	Oct. 20	14.5	11.1	10.6	76,7	....	....	735	26
15635	......do	......do	German	Oct. 20	16.6	13.4	12.7	80.5	....	....	1,615	57
15771	C. Barnard	......do	......do	Oct. 23	16.0	12.7	12.1	79.5	....	....	940	33

Summary of results by States and counties—Continued.

IOWA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield, beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15772	C. Barnard	Allamakee	German	Oct. 23	14.9	10.60	10.10	71.4			1,315	46
15773	do	do	do	Oct. 23	14.9	11.40	10.80	76.4			1,345	48
15774	do	do	French	Oct. 23	16.1	13.60	12.90	84.6			745	26
15818	Jos. Schrieber	do	German	Oct. 24	17.8	14.40	13.60	81.3			880	31
15823	do	do	French	Oct. 24	17.4	13.60	12.90	78.0			830	29
15877	J. A. Carlson	do	German	Oct. 26	15.0	9.40	8.90	62.6			1,140	40
15881	do	do	French	Oct. 26	15.4	10.60	10.00	69.6			1,040	37
16195	C. J. F. Newell	do	German	Nov. 5	15.5	11.50	10.90	73.9			1,520	54
16196	do	do	French	Nov. 5	15.1	11.30	10.70	74.3			1,855	66
16227	Landelin Haas	do	do	Nov. 6	22.8	19.20	18.20	84.0			720	25
16228	do	do	German	Nov. 6	21.9	18.30	17.40	83.6			560	20
16398	Wm. Lusk	do	do	Nov. 14	21.5	18.30	17.40	85.0			1,120	40
16399	do	do	French	Nov. 14	21.0	18.40	17.40	87.5			945	33
	Average				16.98	13.32	12.64	77.8			1,151	40
15071	H. R. Pierce	Audubon	Kleinwanzlebener	Sept. 16	12.72	8.27	7.86	65.0			1,950	69
15126	Jos. Schuchart	Benton	Vilmorin Improved	Sept. 29	14.3	10.20	9.70	70.7	22.2	2,735	780	28
15637	do	do	do	Oct. 20	16.1	11.80	11.20	73.1			605	21
15886	Wm. Rinderknecht	do	Kleinwanzlebener	Oct. 26	17.5	14.20	13.50	81.0			970	34
15887	do	do	French	Oct. 26	15.4	12.50	11.90	81.3	25	4,358	850	30
15165	Wm. B. Mueller	do	Kleinwanzlebener	Oct. 5	14.4	9.40	8.90	65.3			950	34
15166	do	do	Vilmorin	Oct. 5	14.1	9.30	9.20	68.7			1,050	37
	Average				15.3	11.3	10.7	73.4	23.6	3,547	868	31
15726	A. J. Norris	Black Hawk		Oct. 22	14.98	11.75	11.16	78.4			420	15
16093	J. M. Overman	do	French	Nov. 2	17.31	13.25	12.59	76.5			1,360	48
	Average				16.15	12.50	11.88	77.5			890	32
15514	F. G. Bennett	Boone	Vilmorin	Oct. 17	16.29	13.58	12.90	83.4	13.7	2,659	445	16
16427	do	do	Kleinwanzlebener	Nov. 14	20.23	17.35	16.48	85.8	15.9	4,059	560	20
16141	Jacob Schlierholz	do	do	Nov. 3	19.77	14.20	13.49	71.8	21.0	3,631	415	15
16142	do	do	Vilmorin Improved	Nov. 3	17.27	14.25	13.54	82.5	19.1	3,850	570	20
16224	B. R. Moxley	do		Nov. 6	17.59	15.10	14.35	85.8			805	28
	Average				18.23	14.90	14.15	81.9	17.4	3,550	559	20

15791	Wm. A. Rogers	Buchanan	Kleinwanzlebener	Oct. 23	18.57	15.70	14.92	84.6	16.1	3,664	498	18
16006	A. M. Bingham	do	Vilmorin Improved	Oct. 30	17.09	13.35	12.69	78.0	8.6	1,516	785	28
	Average				17.83	14.53	13.81	81.4	12.4	2,590	642	23
16453	L. Traub	Buena Vista	Vilmorin	Nov. 16	23.57	19.20	18.2	81.2			380	13
16454	do	do	Kleinwanzlebener	Nov. 16	23.70	20.60	19.6	87.0			360	13
	Average				23.64	19.90	18.9	84.1			370	13
15083	J. A. Landes	Butler	French	Sept. 24	13.74	10.18	9.67	75.5			1,990	70
15087	F. B. Cheney	do	do	Sept. 24	12.74	9.25	8.79	72.6			1,740	61
15095	Andrew Glodery	do	German	Sept. 25	15.51	12.15	11.54	78.3			550	19
16132	do	do	do	Nov. 3	17.45	14.30	13.59	81.9			795	28
15351	Frank Beale	do	do	Oct. 13	16.71	13.87	13.17	83.0			690	24
	Average				15.23	11.95	11.35	78.3			1,153	40
15064	F. E. Hamilton	Calhoun	White conical	Sept. 21	13.35	9.76	9.26	73.1	13.9	1,945	2,240	79
16091	J. C. Frick	do	Kleinwanzlebener	Nov. 2	16.91	13.25	12.59	78.4	14.8	2,044	775	27
16036	do	do	Vilmorin Improved	Nov. 2	17.71	13.65	12.92	77.1	20.5	3,678	650	23
16660	E. E. Johnson	do	do	Jan. 8	17.04	15.18	14.44	89.2	5.0		580	20
	Average				16.25	12.96	12.30	79.5	24.8	2,556	1,061	37
16382	S. B. Alspach	Carroll	Vilmorin Improved	Nov. 13	18.9	15.10	14.4	80.0			660	23
15107	E. Gingery	Cass	Vilmorin Improved	Sept. 28	13.97	8.44	8.02	60.0			740	26
15219	do	do	do	Oct. 8	12.58	8.55	8.13	68.0			2,070	73
15767	S. Carver	do	German	Oct. 23	14.45	10.60	10.07	73.4			2,240	79
15768	do	do	French	Oct. 23	16.67	12.75	12.11	76.5			1,380	49
15728	J. M. Lehman	do	Kleinwanzlebener	Oct. 22	15.88	12.04	11.78	78.0			1,040	37
16576	do	do	Vilmorin Improved	Nov. 27	17.28	12.80	12.16	74.1			730	26
15247	R. White	do			11.13	7.66	7.28	69.0			1,520	54
	Average				14.57	10.41	9.94	71.3			1,389	49
15418	C. L. Schiele	Cedar	Kleinwanzlebener	Oct. 15	14.35	10.91	10.36	74.4			158	6
15639	G. W. Barclay	do	do	Oct. 20	15.89	12.70	12.07	80.0			795	28
15640	do	do	Vilmorin Improved	Oct. 20	16.59	13.20	12.54	79.5			465	16
15641	do	do	Champion	Oct. 20	13.78	9.40	8.93	68.2			1,110	39
	Average				15.15	11.55	10.98	75.5			632	22
16089	H. Graff	Cherokee	French	Nov. 2	13.39	9.40	8.93	70.2	29.6	3,350	780	28
16450	do	do	do	Nov. 16	15.00	11.10	10.50	74.0			1,615	57
	Average				14.20	10.25	9.72	72.1	29.6	3,350	1,198	43
15310	G. I. Armitage	Clarke	Conical	Oct. 12	17.08	9.20	8.74	53.9			290	10
16599	J. Schmidt	Clay	Vilmorin	Nov. 29	16.8	13.30	12.60	78.8	25	4,475	610	22

Summary of results by States and counties—Continued.

IOWA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16600	J. Schmidt	Clay	Kleinwanzlebener	Nov. 29	17.8	14.8	14.00	82.9			730	26
	Average				17.3	14.05	13.30	80.9	25	4,475	670	24
15005	F. E. Maha	Clayton	Kleinwanzlebener	Aug. 25	15.39	9.10	8.65	59.0			765	27
15025	do	do	do	Sept. 14	16.29	13.15	12.50	80.7			1,240	44
16255	J. W. X. Smith	do	do	Nov. 7	16.35	12.40	11.80	75.9			980	35
16256	do	do	do	Nov. 7	16.57	13.10	12.40	78.8			500	18
	Average				16.15	11.94	11.34	73.6			871	31
15451	C. C. Pachta	Crawford	Kleinwanzlebener	Oct. 16	13.28	9.34	8.87	70.3	17.6	1,983	1,610	57
15919	A. F. Bond	do	Conical	Oct. 27	13.62	9.50	9.02	69.8			1,030	36
16634	H. Konekamp	do	German	Dec. 7	19.24	15.15	14.40	78.8			1,030	36
	Average				15.38	11.33	10.76	73.0	17.6	1,983	1,223	43
15177	L. L. Feather	Dallas	Vilmorin Improved	Oct. 6	17.37	14.46	13.74	83.2	16.7	3,440	490	17
15346	do	do	Kleinwanzlebener	Oct. 13	15.02	12.34	11.72	82.2	16.7	2,906	690	24
15419	J. H. Conley	do	Vilmorin	Oct. 15	15.65	10.50	9.98	66.9	24.2	2,914	620	22
15420	do	do	do	Oct. 15	17.37	13.28	12.62	73.6	12	2,004	540	19
15421	do	do	Kleinwanzlebener	Oct. 15	17.17	13.69	13.00	79.8			415	15
15819	do	do		Oct. 24	17.27	12.70	12.09	73.5	24	3,806	520	18
15822	do	do	Kleinwanzlebener	Oct. 24	15.95	11.60	10.02	72.3			815	29
15879	do	do	Vilmorin Improved	Oct. 26	15.75	11.30	10.73	71.7			640	23
16251	do	do	Vilmorin	Nov. 7	18.27	13.90	13.21	76.1	24.2	4,391	670	24
16252	do	do	Kleinwanzlebener	Nov. 7	17.17	14.20	13.49	80.0	10.9	2,124	740	26
15253	do	do	Vilmorin	Nov. 7	16.87	12.60	11.97	74.7	12	1,937	660	23
15638	W. A. Ulum	do	Kleinwanzlebener	Oct. 20	16.89	13.50	12.83	80.0			755	27
15723	Geo. Roberts	do	do	Oct. 22	18.39	14.25	13.54	77.5			420	15
15766	Lindsley Willis	do	do	Oct. 23	13.95	10.00	9.50	71.7			765	27
15769	T. J. Jones	do	Vilmorin	Oct. 23	14.45	11.25	10.69	77.8			910	32
15878	Adelbert Thornburg	do	Kleinwanzlebener	Oct. 26	15.05	10.55	9.92	70.1			595	21
15884	Truman Buck	do	Vilmorin Improved	Oct. 26	17.71	14.50	13.77	81.6			570	20
15924	Martin O. Malley	do	Kleinwanzlebener	Oct. 27	16.22	12.30	11.69	75.8			640	23
15770	W. Pepper	do	do	Oct. 23	16.47	13.45	12.78	81.7	17.4	3,282	660	24
	Average				16.47	12.65	11.96	76.3	17.6	2,978	638	23
16350	J. S. Stark	Davis		Nov. 10	18 1	10.8	10.2	59.5			610	22

16259	M. W. Blair	Des Moines	Vilmorin Improved	Nov. 7	18.70	14.50	13.80	77.7	21.3	4,115	1,080	38
16254	do	do	Kleinwanzlebener	Nov. 7	19.80	14.50	13.80	73.3	14.6	2,660	865	30
	Average				19.25	14.50	13.80	75.5	18.0	3,388	973	34
16226	R. R. Wilcox	Dickinson	French	Nov. 6	14.70	11.30	10.7	76.7	16.3	2,422	415	15
16598	J. W. Bapp	Fayette	Kleinwanzlebener	Nov. 29	16.00	11.05	10.09	71.9			735	26
15218	Isaac Bird	Franklin	Kleinwanzlebener	Oct. 8	14.58	10.48	9.95	71.9	20.0	2,584	365	13
16133	do	do	do	Nov. 3	18.20	13.30	12.60	73.3	18.9	3,147	380	13
15588	H. Boddy	do	Kleinwanzlebener	Oct. 19	14.75	11.50	10.93	78.6			810	29
16191	do	do	do	Nov. 5	16.40	12.50	11.90	75.9	18.5	3,010	1,545	55
16193	Wm. Fackler	do		Nov. 5	19.50	15.30	14.50	78.6	18.7	3,756	990	35
16194	John Hayes	do		Nov. 5	18.10	13.80	13.10	76.1			1,020	36
15589	Adam Keller	do	Kleinwanzlebener	Oct. 19	15.85	12.35	11.73	77.9	15.2	2,572	750	26
	Average				16.77	12.75	12.10	76.0	18.30	3,014	837	30
16345	John Decker	Green	German	Nov. 10	17.20	13.50	12.80	78.5			925	33
16346	do	do	French	Nov. 10	15.90	11.60	11.00	72.8			1,210	43
16348	A. J. Dudley	do	German	Nov. 10	18.70	14.20	13.40	75.7			1,220	43
16354	Carl Dennherrett	do	Kleinwanzlebener	Nov. 10	19.50	15.00	14.30	77.0			1,550	55
	Average				17.83	13.58	12.88	76.0			1,226	44
15569	E. Rockhill	Grundy	Vilmorin	Oct. 19	14.55	11.90	11.31	81.8			780	28
16225	do	do	do	Nov. 6	17.09	14.05	13.35	82.2	20.9	4,140	605	21
15729	Henry Bash	do		Oct. 22	13.58	9.85	9.36	72.6	24.0	2,945	855	30
	Average				15.07	11.93	11.34	78.9	22.5	3,543	747	26
15081	Wm. Oxley	Hancock	French	Sept. 24	13.24	9.67	9.18	73.0			1,910	68
16042	do	do	do	Oct. 31	16.15	11.50	10.93	71.2			1,000	35
	Average				14.70	10.59	10.06	72.1			1,455	52
15136	W. A. Lesh	Hardin	Vilmorin Improved	Oct. 2	16.29	13.24	12.58	81.2	19.0	3,504	590	21
15186	L. W. Price	do	White	Oct. 6	14.85	11.10	9.60	74.8			450	16
15880	J. J. Thornton	do	Vilmorin Improved	Oct. 26	18.37	14.40	13.68	78.4			445	16
16351	do	do	do	Nov. 11	17.79	13.30	12.64	74.8			530	19
15882	Jonathan Edgington	do	Kleinwanzlebener	Oct. 26	16.05	12.25	11.64	76.3			565	20
15764	do	do	do	Oct. 23	15.05	12.20	11.59	81.1			625	22
15881	J. F. Martin	do	Vilmorin Improved	Oct. 26	16.05	11.70	11.11	69.2	20.3	2,818	600	21
16349	do	do	do	Nov. 11	17.89	14.35	13.63	80.2	20.3	4,000	675	24
16452	C. Clausing	do	French	Nov. 16	18.67	16.00	15.20	85.7			870	31
	Average				16.78	13.17	12.41	78.0	19.9	3,441	594	21
15018	F. J. Porter	Harrison		Sept. 19	9.40	5.60	5.30	60.1			2,315	82
15052	H. E. Buxton	do	Kleinwanzlebener	Sept. 19	13.60	9.30	8.80	68.4			660	23

Summary of results by States and counties—Continued.

IOWA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15685	A. C. Pryor	Harrison	Kleinwanzlebener	Oct. 21	13.90	10.20	9.70	73.3			1,440	51
15686	do	do	do	Oct. 21	18.10	9.80	9.30	53.8			1,510	53
15687	A. D. Hoyer	do		Oct. 21	14.10	11.30	10.70	79.7			675	24
15885	Frank Brewster	do		Oct. 26	15.60	12.20	11.60	78.5			575	20
16094	F. H. Ludwig	do	Kleinwanzlebener	Nov. 2	13.50	8.30	7.89	61.2			1,540	54
	Average				14.03	9.52	9.04	67.9			1,245	37
15350	A. O. Olson	Humboldt	Kleinwanzlebener	Nov. 13	16.11	12.66	11.98	78.6	20.5	3,496	510	18
16192	J. T. Montgomery	Ida	Kleinwanzlebener	Nov. 5	15.30	11.40	10.80	73.9			1,605	57
15568	Henry Schadt	Iowa	Kleinwanzlebener	Oct. 19	15.77	12.55	11.92	79.6	17	2,908	410	14
15573	do	do	French	Oct. 19	15.47	12.85	12.21	83.1	18.1	3,310	390	14
16197	do	do	Kleinwanzlebener	Nov. 5	16.43	12.50	11.88	75.9	17.2	2,790	530	19
16198	do	do	French	Nov. 5	14.53	11.25	10.69	77.3	19.2	2,857	735	26
	Average				15.55	12.29	11.68	79.0	17.9	2,966	514	18
15570	J. W. Preston	Jasper	French	Oct. 19	12.75	8.40	7.98	65.9			1,470	52
16296	do	do	do	Nov. 9	16.75	11.90	11.31	71.0			960	34
15572	P. F. Johnson	do	Improved conical	Oct. 19	10.54	6.75	6.41	64.4			1,110	39
16092	Rev. A. Lyman	do	Vilmorin Improved	Nov. 2	17.31	13.70	13.02	79.1			865	31
	Average				14.34	10.19	9.68	70.1			1,101	39
15275	W. E. Pearson	Jefferson		Oct. 10	17.60	14.10	13.50	80.3			355	13
16641	W. S. Jamieson	Lee	Kleinwanzlebener	Dec. 21	17.27	12.35	11.73	71.4			720	25
15237	David Wild	Linn	Kleinwanzlebener	Oct. 9	13.03	9.62	9.14	74.0			965	34
15238	do	do	do	Oct. 9	16.93	12.61	11.98	74.2			440	16
15643	do	do	do	Oct. 20	16.60	13.40	12.70	80.9			484	17
15239	Wm. Koss	do	Bulteau Desprez	Oct. 9	17.03	12.88	12.23	75.7			93	3
	Average				15.90	12.13	11.51	76.2			496	18
15152	A. L. Whitten	Lucas	Kleinwanzlebener	Oct. 3	18.60	14.80	14.00	79.8	13	2,629	495	17
16137	do	do	do	Nov. 3	19.47	15.05	14.30	77.3	19.6	3,908	485	17
	Average				19.04	14.93	14.15	78.6	16.3	3,268	490	17

15578	A. Foehlinger	Mahaska	Kleinwanzlebener	Oct. 19	12.05	8.50	7.60	70.5			725	26
15579	......do	......do	French conical	Oct. 19	12.64	7.20	6.84	57.0			735	26
15580	Mel. I. Freeman	......do	German	Oct. 19	12.85	9.15	8.69	71.2			1,520	54
15581	W. H. Whitmer	......do	French conical	Oct. 19	14.65	10.70	10.16	73.0			750	26
15582	J. G. Harrold	......do	German	Oct. 19	15.85	12.00	11.40	75.8			1,215	43
15583	A. W. Swahn	......do	French	Oct. 19	16.97	13.00	12.35	76.6			745	26
15587	......do	......do	......do	Oct. 19	15.05	11.60	11.02	77.1			905	32
15584	T. E. Whitaire	......do	German	Oct. 19	15.25	13.10	12.45	86.0			905	32
15585	E. T. Ryan	......do	French	Oct. 19	16.65	12.05	11.45	72.4	21.8	3,259	900	32
15586	Eli Ketner	......do	German	Oct. 19	15.75	11.85	11.26	75.2			995	35
15988	Jacob Alder	......do	......do	Oct. 30	16.80	12.20	11.59	75.4	22	4,743	825	29
15989	John Wilt	......do	French	Oct. 30	18.59	14.35	13.63	77.2			840	30
15990	John Moore	......do	German	Oct. 30	13.78	10.15	9.65	73.6			820	29
15991	J. H. Denberger	......do	White French	Oct. 30	14.28	9.80	9.30	69.6			685	24
15992	Wm. Tormeull	......do	German	Oct. 30	19.09	14.40	13.68	75.5			725	26
15993	Perry F. Edris	......do	Kleinwanzlebener	Oct. 30	15.88	11.10	10.58	70.0			480	17
15994	John Moody	......do	Vilmorin Improved	Oct. 30	15.88	10.80	10.27	68.0	16	2,281	600	21
15998	......do	......do	Kleinwanzlebener	Oct. 30	15.08	10.50	9.97	69.6			450	16
15997	D. C. Garwood	......do	Vilmorin	Oct. 30	21.19	17.20	16.34	81.2	13.1	3,135	215	8
15995	......do	......do	Kleinwanzlebener	Oct. 30	20.49	16.00	15.20	78.1	9.1	1,808	165	6
15999	J. E. Lord	......do	German	Oct. 30	20.09	17.25	16.39	85.9			270	10
16000	W. A. Bryan	......do	......do	Oct. 30	13.58	9.75	9.25	71.8			1,475	52
16001	Jno. D. Thomas	......do	......do	Oct. 30	16.59	12.70	12.07	76.5	17.4	2,899	485	17
16002	Wm. Pickerall	......do	......do	Oct. 30	14.58	9.65	9.17	66.3			475	17
16003	Clark Terrell	......do	......do	Oct. 30	16.18	11.75	11.16	72.6			1,130	40
16004	J. Hull	......do	......do	Oct. 30	15.08	10.50	9.97	69.6			1,075	38
15575	......do	......do	French white	Oct. 19	12.75	8.75	8.42	68.7			1,055	37
15576	S. L. Sherman	......do	French conical	Oct. 19	14.15	11.30	10.73	80.0	23.5	3,267	1,160	41
	Average				15.78	11.69	11.09	73.7	17.56	3,056	797	28
15072	D. H. Litchfield	Marion	Vilmorin	Sept. 22	14.83	9.83	9.34	66.3	17.64	1,972	1,080	38
15642	G. Roorda	......do		Oct. 20	12.78	9.00	8.55	70.4			1,285	45
15923	P. J. Koelman	......do		Oct. 27	13.29	8.85	8.41	67.0			1,105	39
15582	Jno. E. Roorda	......do		Oct. 10	12.68	8.93	8.48	70.3			712	25
	Average				13.40	9.15	8.70	68.5	17.64	1,972	1,046	37
15167	W. H. Weatherly	Marshall		Oct. 5	10.30	5.60	5.30	53.8			450	16
15182	Eugene Wood	......do	Vilmorin	Oct. 6	17.90	14.60	13.90	81.6			650	23
15976	......do	......do	......do	Oct. 29	16.50	13.30	12.90	82.3	16.1	3,090	690	24
15183	J. H. Chinn	......do	German	Oct. 6	13.60	9.10	8.70	67.2			560	20
16424	......do	......do	......do	Nov. 16	16.30	12.20	11.60	74.4			490	17
15220	Stewart Bosworth	......do		Oct. 8	15.70	11.90	11.20	75.3	19	1,899	440	16
16294	......do	......do	German	Nov. 9	17.80	13.60	12.90	76.3			535	19
15221	J. B. Brush	......do	......do	Oct. 8	12.30	9.30	8.80	75.3			1,090	39
15249	W. T. Berry	......do	......do	Oct. 9	15.00	11.10	10.60	74.3			1,035	37
15278	J. G. Brown	......do	......do	Oct. 10	15.30	11.00	10.50	71.7			500	18
16131	......do	......do	......do	Nov. 3	20.20	17.10	16.20	84.5	18.1	4,471	365	13
15283	G. W. Herst	......do	Kleinwanzlebener	Oct. 10	15.40	11.80	11.20	76.9			615	22
15313	G. L. Fraser	......do	German	Oct. 12	16.70	13.30	12.70	79.7	5.6	1,018	400	14
15345	A. M. Miller	......do		Oct. 13	14.30	11.60	11.00	81.2			340	12

Summary of results by States and counties—Continued.

IOWA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15347	Henry Moler	Marshall	German	Oct. 13	13.20	7.60	7.20	57.3			690	24
15349	J. M. Rhodes	do	Vilmorin	Oct. 13	15.50	12.40	11.60	80.0			400	14
15567	J. A. Tallman	do	German	Oct. 19	12.00	8.20	7.80	68.7			725	26
15574	George Whitton	do	do	Oct. 19	12.70	8.60	8.20	68.0			455	16
15636	W. H. Stacy	do	Kleinwanzlebener	Oct. 20	15.50	12.50	11.90	80.7			690	24
15644	do	do	do	Oct. 20	14.30	11.30	10.70	78.8	13.3	2,031	1,230	43
15645	Josiah Dillon	do		Oct. 20	14.80	11.90	11.30	80.2	15.0	2,445	590	21
15727	A. T. Birchard	do	Vilmorin	Oct. 22	15.70	11.80	11.20	74.9	17.0	2,567	370	13
16095	do	do	Kleinwanzlebener	Nov. 2	16.00	11.80	11.20	73.8			705	25
16308	do	do	do	Nov. 9	17.00	13.10	12.50	77.2			865	31
16309	do	do	do	Nov. 9	17.60	14.50	13.80	82.6			635	22
16310	do	do	do	Nov. 9	18.70	15.50	14.70	82.8			360	13
16311	do	do	do	Nov. 9	17.00	13.10	12.40	76.9			605	21
16380	do	do	Vilmorin	Nov. 13	20.20	15.10	14.40	74.9			380	13
16381	do	do	do	Nov. 13	21.80	17.20	16.30	78.8	20.3	4,704	510	18
16546	do	do	Kleinwanzlebener	Nov. 23	19.00	13.30	12.60	77.8			510	18
15922	W. R. Haslet	do		Oct. 22	15.20	10.10	9.60	66.4			695	25
16046	Nathan Kirk	do	Kleinwanzlebener	Oct. 31	16.40	10.30	9.70	62.6	23.1	2,541	470	17
16088	Wm. J. Fort	do		Nov. 2	18.00	13.80	13.10	76.7	21.8	3,957	705	25
15977	Benj. E. Shirk	do	do	Oct. 29	19.40	15.40	14.60	79.0			465	16
	Average				16.10	12.15	11.54	75.1	16.93	2,872	595	21
15921	G. W. Moon	Mills		Oct. 22	14.42	11.25	10.69	78.0			1,375	49
16043	T. H. Moore	Manona	Kleinwanzlebener	Oct. 31	17.30	12.40	11.80	71.8			900	32
16044	W. S. Wade	do	do	Oct. 31	17.20	11.60	11.00	67.6			860	30
16045	C. E. Underhill	do	do	Oct. 31	15.50	10.50	10.00	68.0			855	30
16545	John Wilson	do	do	Nov. 23	12.90	9.10	8.60	70.1			600	21
	Average				15.73	10.90	10.35	69.4			804	28
15918	C. C. Plalter	Montgomery	Vilmorin	Oct. 27	14.42	10.25	9.74	71.1			375	13
16090	Peter Erickson	do	do	Nov. 2	17.31	13.25	12.59	76.5			870	31
	Average				15.83	11.75	11.17	73.8			623	22
15030	Samuel Hallock	Muscatine	French	Sept. 14	13.30	9.40	9.00	70.9			1,870	66
16379	do	do	German	Nov. 13	18.80	15.30	14.50	81.3			1,025	36

15044	S. V. Chenoweth	do	do	Sept. 17	15.20	12.10	11.50	79.2			890	32
15272	do	do	do	Oct. 10	17.10	14.10	13.50	83.7			565	20
15242	D. D. Webster	do	Kleinwanzlebener	Oct. 9	17.30	14.10	13.40	81.7			744	26
16139	do	do	do	Nov. 3	19.60	16.40	15.50	83.5			690	24
15765	J. A. Shoultz	do	Vilmorin	Oct. 23	17.40	13.50	12.80	77.7			930	33
16085	Chris Kindler	do	do	Nov. 2	18.30	14.20	13.40	77.3	19.3	3,618	590	21
16506	do	do	Kleinwanzlebener	Nov. 19	20.00	16.80	16.00	83.9			633	22
16507	do	do	Vilmorin	Nov. 19	21.00	17.30	16.40	82.0			700	25
16086	do	do	Kleinwanzlebener	Nov. 2	17.61	13.10	12.45	74.4			546	19
16503	W. H. Hoopes & Sons	do	do	Nov. 19	17.50	15.10	14.30	85.9			697	25
16504	do	do	Vilmorin	Nov. 19	16.10	12.20	11.50	75.3			745	26
16505	do	do	do	Nov. 19	15.50	11.40	10.80	73.4			850	30
16508	Mittman Bros.	do	do	Nov. 19	17.10	15.10	14.40	85.2	7.4	1,633	775	27
16509	do	do	do	Nov. 19	18.30	16.00	15.20	87.3	7.4	1,772	358	13
16510	H. R. Smull	do	do	Nov. 19	17.30	13.80	13.10	80.4	3.1	589	930	33
16511	M. D. Manlove	do	do	Nov. 19	18.00	15.60	14.80	86.5			520	18
16512	do	do	do	Nov. 19	17.00	14.30	13.60	84.0			415	15
16513	C. S. Bird	do	do	Nov. 19	17.00	13.40	12.70	78.4			703	25
16514	B. B. Rankin	do	do	Nov. 19	20.10	17.10	16.20	84.9	2.5	620	650	23
16515	Jake Wackerlin	do	do	Nov. 19	20.30	16.50	15.70	81.2	3.9	896	555	20
16516	do	do	do	Nov. 19	20.00	16.20	15.40	81.9	3.9	885	547	19
16517	Henry Neumeier	do	Kleinwanzlebener	Nov. 19	18.00	14.20	13.40	73.0			900	32
16518	do	do	Vilmorin	Nov. 19	18.20	15.40	14.60	85.0			650	23
16519	do	do	do	Nov. 19	18.30	15.00	14.30	81.8			1,142	40
16608	Elisha Beatty	do	do	Nov. 30	18.20	16.20	15.40	88.8			550	19
16609	do	do	do	Nov. 30	18.30	16.20	15.40	88.3			500	18
16610	G. H. Stiles	do	do	Nov. 30	20.20	17.00	16.20	83.6			440	16
16611	J. E. Hoopes & Co.	do	do	Nov. 30	20.20	18.40	17.40	90.2			550	19
	Average				18.04	14.85	14.10	81.69	6.78	1,430	722	26
16457	E. J. Brewster	Osceola	Kleinwanzlebener	Nov. 16	16.50	12.70	12.00	76.8	21.1	3,515	535	19
16135	A. A. Atwood	Page	Wait's Improved	Nov. 3	13.40	9.30	8.80	68.5			1,240	44
15980	T. H. Jackson	Palo Alto		Oct. 29	19.50	15.90	15.10	81.4	17.9	2,394	1,010	36
15279	J. Wernli	Plymouth	German	Oct. 10	12.48	8.19	7.78	65.5			925	33
15280	do	do	French	Oct. 10	13.18	9.78	9.30	74.1			1,095	39
15423	James Smith	do		Oct. 15	12.55	8.82	8.38	70.0			1,330	47
16376	J. J. Madden	do	German	Nov. 13	16.35	11.85	11.26	72.5			925	33
16383	Henry Taylor	do		Nov. 13	15.25	11.25	10.69	73.8			605	21
16248	Robt. Maxwell	do	Kleinwanzlebener	Nov. 7	12.75	9.70	9.22	76.1			2,040	72
	Average				13.76	9.93	9.44	72.0			1,150	41
16639	Jos. Hawkins	Pocahontas	French		17.87	13.44	12.77	76.8	25.00	44.10		
16640	do	do	do		19.77	16.15	15.34	81.6			5.70	20
	Average				18.82	14.80	14.06	79.2	25.00	44.10	5.70	20

Summary of results by States and counties—Continued.

IOWA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	Per ct.	Per ct.	Tons.	Pounds.	Grams.	Ounces.
15099	R. Wohlgemuth	Polk	Kleinwanzlebener	Sept. 25	11.48	6.89	6.54	60.0	16.3	1,157	1,055	37
15111	Mrs. J. A. Woods	do	Vilmorin Improved	Sept. 28	15.47	10.38	9.86	66.6	22.8	2,064	850	30
15724	do	do	do	Oct. 22	15.79	12.90	12.23	81.1	22.8	4,108	310	11
15449	Paul Fisher	do	French	Oct. 16	15.68	12.10	11.50	77.2			515	18
15450	do	do	Diamond	Oct. 16	16.08	12.40	11.78	77.1			610	22
15452	do	do	German	Oct. 16	15.59	12.75	12.11	81.9	21.6	3,866	370	13
15453	do	do	Kleinwanzlebener	Oct. 16	16.29	13.63	12.95	83.5			460	16
15454	do	do	Vilmorin	Oct. 16	16.79	13.93	13.23	82.9			485	17
15455	do	do	Lanes Imperial	Oct. 16	13.28	9.95	9.45	74.8			470	17
15731	Robt. Fullerton	do	Kleinwanzlebener	Oct. 22	15.08	11.20	10.64	74.1			165	23
15732	do	do	Vilmorin	Oct. 22	14.38	10.45	9.98	71.9			925	33
15920	J. B. Campbell	do	do	Oct. 27	16.74	12.35	11.75	73.7			770	27
	Average				15.22	11.58	11.00	75.4	20.9	2,799	624	23
15035	G. Rabbee	Pottawattamie	German	Sept. 15	12.95	9.54	9.06	73.7			4,840	171
15082	L. D. Crommett	Sac	Kleinwanzlebener	Sept. 24	12.84	9.17	8.71	71.4	20.9	2,345	2,300	81
15448	do	do	do	Oct. 16	15.88	11.48	10.91	72.3			1,565	55
	Average				14.36	10.33	9.81	71.9	20.9	2,345	1,933	68
15122	A. F. Schoening	Scott	Bulteau Desprez	Sept. 29	21.59	16.59	15.76	76.3			510	18
15123	do	do	Vilmorin Improved	Sept. 29	17.89	14.43	13.70	80.6			545	19
15129	C. J. Barr	do	Bulteau Desprez	Oct. 1	17.27	14.41	13.70	83.4	17.2	3,547	475	17
15130	do	do	Vilmorin Improved	Oct. 1	15.67	13.04	12.39	83.2	19.0	3,534	490	17
15216	do	do	Bulteau Desprez	Oct. 8	14.18	10.26	9.75	72.3	13.0	1,647	1,100	39
15217	do	do	Vilmorin Improved	Oct. 8	14.98	11.43	10.86	70.0	11.0	1,507	635	22
15276	Leo Traeger	do	Vilmorin	Oct. 10	14.08	10.55	10.03	74.8	22.0	3,120	730	25
15277	do	do	Kleinwanzlebener	Oct. 10	17.69	13.45	12.84	76.0			720	25
15281	J. K. Pope	do	French	Oct. 10	15.08	11.10	10.54	73.5			930	33
15267	do	do	Kleinwanzlebener	Oct. 10	15.28	10.22	9.71	66.8			780	28
15422	J. R. Porter	do	Bulteau Desprez	Oct. 15	14.67	12.20	11.58	83.0			1,840	65
15513	James Dyer	do	Lanes Imperial	Oct. 17	12.68	9.12	8.66	71.9			975	34
15725	E. J. Hilton	do	Vilmorin	Oct. 22	16.39	14.45	13.73	88.1			705	25
15974	B. H. Lage	do	Bulteau Desprez	Oct. 29	14.23	9.00	8.55	63.2			675	24
15730	Joachim Gueltzow	do	do	Oct. 22	17.19	13.25	12.59	77.1	20.9	3,662	1,225	43
15975	Fritz Jurgensen	do	do	Oct. 29	19.03	15.10	14.35	79.5			560	20
15978	Wm. Steinhoff	do	do	Oct. 29	16.23	12.70	12.07	78.3			1,100	39

16097	J. E. McConnell	do	Vilmorin Improved	Nov.	2	22.01	16.75	15.92	76.1			810	30
16134	B. T. Seaman	do	do	Nov.	3	18.55	14.35	13.63	77.3			965	34
16140	do	do	Bulteau Desprez	Nov.	3	18.97	14.65	13.92	77.2	18	3,590	825	29
16532	do	do	Desprez No. 1, red	Nov.	10	17.49	14.00	13.30	80.0			500	18
16533	do	do	Desprez No. 2, white	Nov.	10	19.79	16.50	15.68	83.4			540	19
16138	Nick Sons	do	Vilmorin	Nov.	3	20.97	16.60	15.77	79.1			500	18
16293	Miles A. Collins	do	Bulteau Desprez	Nov.	9	19.37	13.55	12.87	70.0			1,040	37
16295	do	do	Vilmorin	Nov.	9	20.67	14.65	13.92	70.9			1,170	41
16146	H. Seifers	do	Kleinwanzlebener	Nov.	16	17.37	13.60	12.92	78.3			1,090	39
16558	John H. Koehn	do	French, conical	Nov.	23	19.73	14.70	13.96	74.5			620	22
16249	John B. Kehoe	do	Vilmorin	Nov.	7	17.75	12.25	11.64	69.0			1,040	37
15239	Wm. Koss	do	Desprez	Oct.	9	17.03	12.88	12.23	75.7	17.3		93	3
16657	Geo. Kraft	do	Vilmorin	Dec.	21	17.54	14.00	13.29	80.0			1,530	54
16642	James McGee	do	do	Dec.	21	16.25	12.35	11.73	76.0			820	29
	Average					17.34	13.29	12.63	76.3	17.3	2,944	825	29
15925	C. B. Irwin	Shelby	Kleinwanzlebener	Oct.	27	11.80	8.20	7.80	69.4			650	23
15311	J. W. Hill	Taylor		Oct.	12	14.08	10.28	9.77	73.0			840	30
15312	do	do		Oct.	12	15.08	8.71	8.28	57.7			720	25
	Average					14.58	9.50	9.03	65.4			780	28
15820	Aug. Miller	Union	French	Oct.	24	15.15	11.40	10.83	74.5			1,340	47
15821	do	do	Kleinwanzlebener	Oct.	24	14.65	10.10	9.60	69.0			1,065	38
	Average					14.90	10.75	10.22	71.8			1,203	43
15979	A. H. Morris	Van Buren	French	Oct.	29	18.50	15.10	14.35	81.5	15.2	3,009	280	10
16347	do	do	German	Nov.	11	17.30	13.00	12.35	75.2	7.6	1,274	120	4
	Average					17.90	14.05	13.35	78.4	11.4	2,142	200	7
15010	S. C. Baxter	Wapello	German	Sept.	1	11.70	8.60	8.17	73.3			1,500	53
15343	S. J. Kader	do	do	Oct.	13	16.50	13.40	12.70	81.3			1,100	39
15577	John Strain	do	do	Oct.	19	13.80	9.60	9.10	70.0			980	35
15996	Austin Gray	do	French	Oct.	30	18.10	14.90	14.20	72.4	18.6	3,973	385	14
	Average					15.03	11.63	11.04	74.3	18.6	3,973	991	35
15817	L. A. Stevenson	Warren	Diamond	Oct.	24	14.75	10.00	9.50	67.1			727	26
16384	J. N. Brunson	Webster	Kleinwanzlebener	Nov.	13	17.20	14.10	13.4	82.0	24	4,764	450	16
16005	J. J. Taylor	Winnebago		Oct.	30	16.30	12.50	11.90	76.7			895	32
16475	J. J. Otis	do	Kleinwanzlebener	Nov.	17	19.60	14.60	13.80	74.3			1,270	45
	Average					17.95	13.55	12.85	75.5			1,083	39

Summary of results by States and counties—Continued.

IOWA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15917	James A. Smith	Wright		Oct. 27	13.42	9.85	9.36	73.4			1,165	41
16130	W. C. Morton	......do	Kleinwanzlebener	Nov. 3	16.65	13.60	12.92	81.6	24.6	4,681	470	17
16136	......do	......do	Vilmorin	Nov. 3	18.27	14.70	13.97	80.5	18.3	3,713	420	15
	Average				16.11	12.72	12.08	78.5	21.5	4,197	685	24
	Average of State				16.32	12.46	11.82	75.7	17.27	2,914	833	30

KANSAS.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets (grams).	Average weight of beets (ounces).
16243	William Lehman	Bourbon	German	Nov. 7	19.27	13.0	12.35	67.5			470	17
16244	......do	......do	French	Nov. 7	16.65	10.9	10.36	65.5			510	18
	Average				17.96	11.95	11.36	66.5			490	18
15040	George J. Benish	Edwards		Sept. 16	20.22	15.58	14.80	77.0			1,220	43
15930	Thomas K. Clark	Ellis	Imperial	Oct. 27	13.42	9.35	8.88	69.7			1,470	52
16179	Louis Bossing	Ellsworth	German	Nov. 4	15.22	10.85	10.31	71.3			1,780	63
15903	William Boyd	Gove	Kleinwanzlebener	Oct. 26	15.85	11.25	10.69	71.0			915	32
16357	H. Chatelet	Harvey	Vilmorin	Nov. 12	21.99	16.00	15.20	72.8			465	16
16464	......do	......do	......do	Nov. 16	16.97	12.65	12.02	74.6			765	27
	Average				19.48	14.33	13.61	73.7			615	22
15324	Henry Hershner	Jewell		Oct. 12	14.28	10.58	10.51	74.1	17.4	2,439	560	20
16155	J. W. Longstreth	Kearney	Bulteau Desprez	Nov. 3	15.25	11.15	10.59	73.1			675	24
16365	Fannie L. Rewerts	......do	German	Nov. 13	17.27	11.70	11.12	67.7			1,160	41
16366	......do	......do	French	Nov. 13	18.29	13.50	12.82	73.8			790	28
	Average				16.94	12.12	11.51	71.5			875	31

15243	Andrew Leupold	Marshall	Kleinwanzlebener	Oct. 9	13.53	9.26	8.80	68.6			2,150	76
15244	do	do	Vilmorin	Oct. 9	12.43	7.84	7.43	63.2			1,830	65
	Average				12.98	8.55	8.12	65.9			1,990	71
15096	John G. Hasker	Mitchell	Kleinwanzlebener	Sept. 25	13.11	9.51	9.03	72.5			1,260	45
15134	T. J. West	do	Bulteau Desprez	Oct. 2	13.08	9.23	8.77	70.5			965	34
16364	C. S. Farnham	do	Kleinwanzlebener	Nov. 13	13.67	9.20	8.74	67.3			590	21
	Average				13.29	9.31	8.85	70.1			938	33
16156	J. W. Bronaugh	Nemaha	Kleinwanzlebener	Nov. 3	16.37	12.65	12.01	77.3			600	21
15108	Peter Balliet	Ness	Bulteau Desprez	Sept. 28	18.07	11.66	11.08	64.7	15.7	2,023	365	13
15049	Paul Haller	Rawlins	do	Sept. 19	19.93	16.42	15.60	82.4	11.76	2,728	580	20
15188	C. H, Wagler	Reno	Kleinwanzlebener	Oct. 6	14.85	10.24	9.73	69.0	23	2,788	630	22
15128	John F. Miller	Rooks	Vilmorin Improved	Oct. 1	17.15	12.27	11.66	71.5	13	1,955	435	15
15426	do	do	do	Oct. 15	15.15	9.16	8.70	60.9			595	21
	Average				16.15	10.72	10.18	66.2	13	1,955	515	18
16105	Ed. Lotz	Saline	Kleinwanzlebener	Nov. 2	16.29	9.20	8.74	56.6			530	20
16106	do	do	do	Nov. 2	16.59	11.50	10.93	69.4			1,190	42
16107	do	do	do	Nov. 2	19.11	13.35	12.58	69.9			620	22
16108	do	do	do	Nov. 2	17.29	11.80	11.21	68.2			990	35
16109	do	do	do	Nov. 2	15.29	9.00	8.55	58.9			950	34
16110	do	do	do	Nov. 2	15.29	8.30	7.89	54.3			1,420	52
16111	do	do	do	Nov. 2	18.81	12.50	11.87	66.5			790	28
16112	do	do	do	Nov. 2	18.81	12.80	12.16	68.1			890	31
16113	do	do	do	Nov. 2	16.99	8.65	8.22	50.9			900	32
16114	do	do	do	Nov. 2	17.29	11.50	10.93	66.5			590	21
16115	do	do	do	Nov. 2	17.19	11.05	10.50	64.3			940	33
16116	do	do	do	Nov. 2	19.01	13.35	12.58	70.2			620	22
	Average				17.33	11.08	10.51	63.7			873	31
16026	A. M. Simmonds	Smith	Kleinwanzlebener	Oct. 30	12.28	8.00	7.6	65.1			2,080	73
	Average of State				16.45	11.25	10.69	68.2	16.17	2,387	926	33

Summary of results by States and counties—Continued.

KENTUCKY.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16031	T. S. Moberley	Madison		Oct. 31	11.14	6.00	5.70	52.6			1,465	52
16481	C. A. Purdy	Pendleton	French	Nov. 18	16.77	11.75	11.16	70.1			547	19
16482	do	do	German	Nov. 18	16.17	11.05	10.50	68.3			876	31
	Average				16.47	11.40	10.83	69.2			712	25
	Average of State				14.69	9.60	9.12	63.7			963	34

MARYLAND.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
16637	H. D. Alvord	Prince George	Vilmorin	Dec. 7	11.82	8.90	8.45	75.3			370	13
16638	do	do	Lanes	Dec. 7	10.70	6.60	6.27	61.7			530	19
	Average				11.26	7.75	7.36	68.5			450	16

MICHIGAN.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
16232	J. R. Dibble	Allegan	German	Nov. 6	15.58	11.60	11.02	74.5			640	23
16552	W. H. Schuh	do	do	Nov. 23	22.94	19.25	18.29	83.9			650	23
16553	do	do	do	Nov. 23	23.34	20.75	19.71	88.9			415	15
	Average				20.62	17.20	16.34	82.4			568	20
15744	Leonard C. Roach	Barry		Oct. 22	13.31	10.25	9.74	72.5			1,520	54
16154	R. A. Polley	do	Bulteau Desprez	Nov. 3	16.35	11.70	11.12	71.5			900	32
16479	E. L. Hursley	do	do	Nov. 16	15.95	12.07	11.45	75.5			950	34
	Average				15.20	11.34	10.77	73.2			1,123	40
16260	T. H. McGraw	Bay	Lane's Imperial	Nov. 7	12.95	9.50	9.05	73.4			825	29
16595	do	do	Vilmorin	Nov. 29	23.59	18.25	17.33	77.3	21.4	5,109	490	17
	Average				18.27	13.88	13.19	75.4	21.4	5,109	658	23

16425	M. Coneight	Calhoun		Nov. 16	17.63	14.25	13.54	80.8			1,145	40
15085	George Durance	Charlevoix	Bulteau Desprez	Sept. 24	14.94	11.86	11.26	79.5			1,670	59
16023	do	do	French	Oct. 30	15.58	11.30	10.74	72.4			1,095	39
	Average				15.26	11.58	11.00	76.0			1,383	49
16650	S. R. Fuller	Eaton	Kleinwanzlebener	Dec. 21	16.85	12.21	11.60	72.5	24.4	2,704	840	30
16652	do	do	Vilmorin	Dec. 21	17.67	14.01	13.30	79.3	21.8	4,146	600	21
	Average				17.26	13.11	12.45	75.9	23.1	3,425	720	26
16273	C. W. Frazer	Grand Traverse	Kleinwanzlebener	Nov. 9	19.17	15.65	14.87	77.6			540	19
16274	do	do	Vilmorin Improved	Nov. 9	16.17	12.85	12.21	79.5			735	26
	Average				17.67	14.25	13.54	78.6			638	23
15782	H. L. Francisco	Gratiot	Kleinwanzlebener	Oct. 23	16.87	13.75	13.06	81.5	20.4	3,917	360	13
16277	do	do	do	Nov. 9	20.27	17.90	17.01	88.3	20.4	5,530	470	17
16280	H. Brady	do		Nov. 9	17.27	14.40	13.68	83.4	13.5	2,781	990	35
16281	do	do		Nov. 9	17.27	14.40	13.68	83.4	10.7	2,204	430	15
	Average				17.92	15.11	14.36	84.2	16.3	3,608	563	20
15471	William H. Clay	Hillsdale	Vilmorin	Oct. 16	15.58	11.08	10.53	71.1			840	30
15412	Henry J. Wright	do	Kleinwanzlebener	Oct. 15	15.15	11.59	11.01	76.5			1,160	41
16467	J. F. Fogg	do	French	Nov. 16	18.37	15.50	14.72	84.4			390	14
16651	Lovell Bros	do	German	Dec. 21	17.87	14.09	13.38	78.8			1,095	39
	Average				16.74	13.07	12.41	77.7			871	31
16408	J. W. Hicks	Jackson	French	Nov. 14	16.87	14.20	13.49	84.2			1,420	50
16409	W. J. Cavanaugh	do	do	Nov. 14	18.17	15.00	14.25	82.6			355	13
	Average				17.52	14.60	13.87	83.4			888	32
15325	Charles E. Somer	Lapeer	German	Oct. 12	17.28	12.92	12.27	74.8			680	24
15326	do	do	French	Oct. 12	18.09	13.31	12.65	73.6			630	22
	Average				17.69	13.12	12.46	74.2			655	23
16278	John Irwin	Manistee	Vilmorin Improved	Nov. 9	16.17	12.50	11.88	77.3			1,480	52
16279	do	do	do	Nov. 9	17.67	14.00	13.30	79.2			1,210	43
16387	Josiah Hillard	do	Kleinwanzlebener	Nov. 13	16.25	12.25	11.64	75.4			1,240	44
	Average				16.69	12.92	12.27	77.3			1,310	46
16635	Christ Butzer	Muskegon	German	Dec. 7	18.24	15.75	14.97	86.3			805	29
16658	Jacob E. Stobbe	do		Dec. 21	15.57	11.30	10.74	72.7			1,100	39
	Average				16.89	13.53	12.86	79.5			953	34

Summary of results by States and counties—Continued.

MICHIGAN—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15647	Marcus Wightman	Newaygo	Vilmorin	Oct. 20	16.09	13.00	12.35	80.8			387	14
16022	Wm. H. Barry	Oceana	Vilmorin Improved	Oct. 30	17.89	14.00	13.31	78.2			625	22
16649	do	do	do	Dec. 21	16.67	13.77	13.08	82.5	11.87	2,312	480	17
	Average				17.28	13.89	13.20	80.4	11.87	2,312	553	20
15469	Jno. Witt	Osceola	German	Oct. 16	18.99	16.45	15.63	86.6			890	31
15470	do	do	French	Oct. 16	18.89	15.97	15.17	84.6			520	18
	Average				18.94	16.21	15.40	85.6			705	25
16410	Jacob Barense	Ottawa	German	Nov. 14	13.75	11.10	10.55	80.7			800	28
16411	Jno. Leeshouts	do	do	Nov. 14	19.17	16.15	15.34	84.2			880	31
16441	Geo. Ohlmann	do	Silesian	Nov. 16	17.53	13.35	12.68	76.2			840	30
16442	do	do	Vilmorin	Nov. 16	13.63	8.45	8.03	63.5			660	23
	Average				16.02	12.26	11.65	76.2			795	28
16172	Jerre Becker	Saginaw	Kleinwanzlebener	Nov. 4	14.82	11.50	10.93	77.6			1,970	70
16173	H. M. Youmans	do	do	Nov. 4	20.04	16.50	15.67	82.6			1,240	44
16174	S. H. Webster	do	do	Nov. 4	12.52	8.05	7.65	64.3			2,060	73
	Average				15.79	12.02	11.42	74.8			1,757	62
15983	Wm. W. Teal	St. Joseph	Vilmorin	Oct. 29	15.53	11.30	10.73	72.8			1,273	45
15362	Michael Gates	Van Buren	French	Oct. 13	11.42	8.49	8.06	74.5	17.4	1,921	565	20
15939	do	do	do	Oct. 27	16.64	12.45	11.83	74.8	16.6	2,649	765	27
15960	Jas. G. Babbitt	do		Oct. 28	14.75	11.40	10.83	77.3			1,015	36
16468	J. P. Bewley	do	French	Nov. 16	15.15	11.35	10.78	74.9			1,570	55
16469	do	do	German	Nov. 16	17.37	12.50	11.88	72.0			1,120	40
	Average				15.07	11.24	10.68	74.7	17.0	2,285	1,007	36
	Average of State				16.91	13.31	12.64	78.0	17.20	3,444	906	32

MINNESOTA.

16362	Jno. Hunter	Anoka	French	Nov. 13	18.99	15.00	14.25	79.0			445	16
15932	Fred. Koenig	Brown	Vilmorin Improved	Oct. 27	16.22	11.35	10.79	70.0			740	26
15933	do	do	Kleinwanzlebener	Oct. 27	13.82	9.25	8.79	67.0			1,300	46
	Average				15.02	10.30	9.79	68.5			1,020	36
16451	Narve Narvesen	Clay		Nov. 16	13.35	9.05	8.60	67.8			1,690	60
15931	J. G. Cook	Dakota	Vilmorin Improved	Oct. 27	16.14	12.50	11.88	77.4			590	21
16433	Geo. W. Doag	Faribault	White	Nov. 16	17.23	12.65	12.02	73.4			810	29
16434	W. Z. Haight	do	do	Nov. 16	16.43	12.45	11.83	75.8			1.045	37
16435	do	do	do	Nov. 16	16.53	13.00	12.35	78.6			685	24
16592	Wm. Waldren, jr	do	Kleinwanzlebener	Nov. 29	19.17	14.20	13.49	74.0	7	1,260	520	18
	Average				17.34	13.08	12.42	75.5	7	1,260	765	27
15214	Ed. Dagen	Fillmore	Kleinwanzlebener	Oct. 8	17.08	13.48	12.81	79.2	10	1,870	490	17
15215	do	do	Vilmorin	Oct. 8	16.68	11.76	11.17	70.6	11	1,566	560	20
	Average				16.88	12.62	11.99	74.9	10.5	1,718	525	19
16436	A. F. Neil	Goodhue	French	Nov. 16	21.03	16.20	15.39	77.0			700	25
16437	do	do	German	Nov. 16	18.13	14.15	13.44	78.0	21.8	4,125	565	20
16465	J. C. Dickey	do		Nov. 16	18.17	15.30	14.54	84.2	21.8	4,820	530	19
16466	do	do	French	Nov. 16	20.27	17.50	16.63	86.3	17.4	4,505	415	15
	Average				19.40	15.79	15.00	81.4	20.3	4,483	553	20
16604	C. Benjamin	Hennepin	Vilmorin	Nov. 30	17.33	14.20	13.49	80.4			1,040	37
16605	do	do	Kleinwanzlebener	Nov. 30	17.73	13.35	12.69	77.9			900	32
	Average				17.53	13.78	13.09	79.2			970	35
16439	Wm. H. Hatch	Linn	French	Nov. 16	12.63	8.00	7.60	63.4			2,085	74
16440	do	do	do	Nov. 16	15.53	10.60	10.07	68.3			1,000	35
	Average				14.08	9.30	8.84	65.9			1,543	55
15062	Wm. Katheman	McLeod	Kleinwanzlebener	Sept. 21	16.05	11.40	10.83	71.1			1,330	47
16330	J. Eisenlohr	Martin	French	Nov. 10	13.67	9.55	9.07	69.9			1,650	58
15015	J. T. Rutherford	Mower	French	Sept. 6	18.98	15.92	15.12	83.8			655	23
15109	do	do	do	Sept. 28	17.47	11.63	11.05	66.5			840	30
16629	A. F. Wagner	do	German	Dec. 7	18.44	15.05	14.30	81.6			490	17
16630	Benj. Wright	do	French	Dec. 7	20.64	15.90	15.10	77.0	30		430	15

Summary of results by States and counties—Continued.

MINNESOTA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16631	T. C. Hopkins	Mower	German	Dec. 7	19.54	16.70	15.86	85.9			970	34
16632	L. Wheeler	do	do	Dec. 7	21.74	17.40	16.53	80.0			880	31
16633	W. Haskins	do	French	Dec. 7	20.44	15.20	14.45	74.3			670	24
	Average				19.61	15.40	14.63	78.4	30		705	25
15415	Arthur Simpson	Murray		Oct. 15	13.15	9.98	9.48	75.6			730	26
15688	Iver Johnson	do	Kleinwanzlebener	Oct. 21	14.61	10.50	9.97	71.9			735	26
	Average				13.88	10.24	9.73	73.8			733	26
16396	D. T. Mitchell	Polk	Kleinwanzlebener	Nov. 14	20.67	17.05	16.20	82.5	24.4	5,958	820	29
16412	do	do	Vilmorin Improved	Nov. 14	19.17	15.40	14.63	80.3	20.7	4,388	890	31
	Average				19.92	16.23	15.42	81.4	22.6	5,173	855	30
15783	Simon Swenson	Pope		Oct. 23	16.47	12.75	12.11	77.4			235	8
16124	Wm. Carncross	Sibley	Kleinwanzlebener	Nov. 2	14.29	10.20	9.70	71.3	17.6	2,077	770	27
16125	do	do	Vilmorin Improved	Nov. 2	16.49	11.90	11.31	72.7	22.9	3,407	815	29
16602	Geo. B. Schrupp	do	German	Nov. 30	19.13	14.10	13.39	73.7	13.0	2,317	750	26
16603	do	do	French	Nov. 30	19.83	14.70	13.97	74.1	12.6	2,354	740	26
	Average				17.44	12.73	12.09	73.0	16.5	2,539	769	27
15367	D. T. Wheaton	Stevens	Bulteau Desprez	Oct. 13	12.42	8.84	8.40	71.3	24.4	2,635	375	12
15655	G. W. Smitten	do		Oct. 20	13.68	10.05	9.55	73.5			950	34
	Average				13.05	9.45	8.98	72.4	24.4	2.635	663	24
15656	Peter Klug	Waseca	Vilmorin	Oct. 20	15.39	12.60	11.97	81.9	20.7	3,662	600	21
16494	do	do	Vilmorin Improved	Nov. 19	17.33	13.60	12.92	78.5	20.9	3,827	615	22
	Average				16.36	13.10	12.45	80.2	20.8	3,745	608	22
	Average of State				17.12	13.03	12.38	75.7	18.5	3,251	806	29

MISSOURI.

16206	S. Goodson	Adair	French	Nov. 5	16.33	12.00	11.41	73.4			2,055	73
16331	Scott Spencer	do	do	Nov. 10	16.67	11.00	10.45	66.0			665	23
16332	A. J. Garlock	do	German	Nov. 10	14.97	11.35	10.78	75.8			1,000	35
16355	do	do	French	Nov. 11	17.79	13.30	12.64	74.8			1,870	66
16685	John Patterson	do	do	Jan. 22	16.37	10.18	9.68	62.2			530	19
16686	do	do		Jan. 22	19.17	11.71	11.13	61.1			366	13
16687	do	do	Vilmorin	Jan. 22	15.37	8.94	8.50	58.2			550	19
	Average				16.67	11.21	10.66	67.4			1,005	35
16698	Thos. P. Withers	Barry		Jan. 22	15.33	10.12	9.62	66.0			493	17
16681	J. J. Conrad	Bollinger	French	Jan. 22	21.80	10.61	10.08	48.7			182	6
16718	Mo. Agr. Station	Boone	White Silesian	Jan. 22	14.33	7.29	6.93	50.9			470	17
16719	do	do	Wohauka	Jan. 22	14.23	10.28	9.77	72.4			383	14
16720	do	do	French	Jan. 22	16.33	9.64	9.16	59.6			490	17
16721	do	do	Simon-Legrand	Jan. 22	17.73	13.05	12.40	73.6			315	11
16722	do	do	Vilmorin	Jan. 22	19.63	13.44	12.77	68.5			476	17
16723	do	do	Kleinwanzlebener	Jan. 22	19.53	11.64	11.06	59.6			270	10
16724	do	do	Florimond Desprez	Jan. 22	18.03	12.62	11.99	70.0				
	Average				17.12	11.14	10.58	64.9			401	14
16694*	Frank W. Arms	Caldwell	Vilmorin	Jan. 22	22.44	15.79	15.01	70.4			310	11
16695*	do	do	French	Jan. 22	21.54	17.91	17.02	83.1			283	10
16696*	do	do	Wohauka	Jan. 22	22.44	16.47	15.65	73.4			343	12
16697*	do	do	White Silesian	Jan. 22	21.94	14.67	13.94	66.9			457	16
	Average				22.09	16.21	15.41	73.5			348	12
16702*	Dr. D. H. Webster	Cass	Vilmorin	Jan. 22	18.33	11.87	11.28	64.8			322	11
16703*	do	do	French	Jan. 22	18.03	12.03	11.47	66.7			207	7
	Average				18.18	11.95	11.38	65.8			265	9
16673*	Geo. S. Wilson	Dade	French	Jan. 22	17.60	9.13	8.68	51.9			420	15
16674*	do	do	Wohauka	Jan. 22	15.60	6.51	6.19	41.7			486	17
16675*	do	do	Vilmorin	Jan. 22	15.30	6.45	6.13	42.2			387	14
16676*	do	do	White Silesian	Jan. 22	17.80	9.10	8.65	51.1			310	11
	Average				16.58	7.80	7.41	46.7			401	14
16688*	W. H. Hickman	Daviess	Wohauka	Jan. 22	19.77	12.47	11.87	63.2			710	25
16689*	do	do	Vilmorin	Jan. 22	20.07	13.25	12.59	66.0			665	23
	Average				19.92	12.86	12.23	64.6			688	24

* Sent by State agricultural station.

Summary of results by States and counties—Continued.

MISSOURI—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16715*	Jos. Kirchgraber	Greene	Wohauka	Jan. 22	18.33	11.27	10.71	61.5			475	17
16716*	do	do	French	Jan. 22	18.83	6.80	6.46	36.1			490	17
16717*	do	do	Wohauka	Jan. 22	13.53	7.64	7.26	56.5			650	23
	Average				16.90	8.57	8.14	51.4			538	19
16700*	C. H. Hartsook	Henry	Vilmorin	Jan. 22	14.73	9.99	9.50	67.8			423	15
16701*	do	do	French	Jan. 22	17.27	10.36	9.85	60.0			376	13
	Average				16.00	10.18	9.68	63.9			400	14
16707*	Col. J. C. Evans	Jackson		Jan. 22	18.83						500	18
16708*	do	do		Jan. 22	17.43	14.97	14.23	85.8			533	19
16709*	do	do		Jan. 22	18.63	10.89	10.35	58.5			1,060	37
16710*	do	do		Jan. 22	16.33	10.52	10.00	64.4			1,620	57
	Average				17.81	12.13	11.53	69.6			928	33
16690*	Jas. Shouse	Knox	Wohauka	Jan. 22	19.27	13.34	12.68	69.2			182	6
16691*	do	do	French	Jan. 22	19.87	14.93	14.19	75.1			200	7
16692*	do	do	Vilmorin	Jan. 22	19.00	11.29	10.73	59.4			385	14
16693*	do	do	White Silesian	Jan. 22	22.94	16.67	15.84	72.7			200	7
	Average				20.27	14.06	13.36	69.1			242	9
16562	Melchior Rehg	Lafayette	White Silesian	Nov. 24	15.63	11.75	11.16	75.3			460	16
16706	Teubner Aull	do	French	Jan. 22	20 23	13.20	12.34	65.2			365	13
	Average				17.93	12.48	11.75	70.3			413	15
15745	Aug. Gloeser	Lewis	Vilmorin	Oct. 22	16.89	13.50	12.82	80.0			665	23
16439	Wm. H. Hatch	Linn	French	Nov. 16	12.63	8.00	7.60	63.4			2,085	74
16440	do	do	do	Nov. 16	15.53	10.60	10.07	68.3			1,000	35
	Average				14.08	9.30	8.84	65.9			1,543	55
15034	Albert Voohris	Livingston		Sept. 15	16.37	12.59	11.96	76.9			1,800	64

15116	Andreas Bestgen	Morgan	German	Sept. 29	12.97	7.98	7.58	58.4	26	2,080	515	18
15120	do	do	French	Sept. 29	14.57	9.75	9.26	66.9	24	2,688	360	13
	Average				13.77	8.87	8.42	62.7	25	2,384	438	16
16670*	G. W. Waters	Ralls	French	Jan. 22	12.10	3.82	1.91	31.6			308	11
16771*	do	do	White Silesian	Jan. 22	8.80	2.14	1.07	24.3			380	13
	Average				10.45	2.98	1.49	28.0			344	12
16677*	F. A. Scott	Randolph	French	Jan. 22	16.70	7.77	7.39	46.5			783	28
16678*	do	do	Wohauka	Jan. 22	16.90	8.13	7.73	48.1			566	20
16679*	do	do	White Silesian	Jan. 22	18.30	8.97	8.53	49.0			823	29
16680*	do	do	Imperial	Jan. 22	18.30	7.51	7.14	41.1			696	25
	Average				17.55	8.10	7.70	46.2			717	26
16699*	R. W. Mueller	St. Charles	French	Jan. 22	17.83	11.98	11.38	67.2			1,350	48
16682*	Wm. Muir	St. Louis	French	Jan. 22	17.70	9.23	8.77	52.1			178	6
16683*	do	do	Vilmorin	Jan. 22	15.67	10.76	10.22	68.7			216	8
16684*	do	do	Wohauka	Jan. 22	18.77	12.81	12.17	68.2			152	5
	Average				17.38	10.93	10.39	63.0			182	6
15555	Chas. E. Vohon	Shelby	Vilmorin	Oct. 19	14.95	11.25	10.68	75.3	16.3	2,368	430	15
16672	J. G. Burckhardt	do	White Silesian	Jan. 22	20.70	12.60	11.97	60.9			360	13
	Average				17.83	11.93	11.33	68.1	16.3	2,368	395	14
16704*	J. H. Logan & Sons	Vernon	Wohauka	Jan. 22	18.63	12.80	12.16	68.6			623	22
16705*	do	do	do	Jan. 22	20.53	14.54	13.82	70.8			386	14
	Average				19.58	13.67	12.99	69.7			575	18
16711*	Fred. L. Jabin	Warren	White Silesian	Jan. 22	16.83	11.34	10.78	63.4			235	8
16712*	do	do	Vilmorin	Jan. 22	18.03	11.18	10.63	62.0			263	9
16713*	do	do	Wohauka	Jan. 22	18.03	10.60	10.07	58.8			230	8
16714*	do	do	French	Jan. 22	18.33	10.62	10.09	57.9			506	18
	Average				17.81	10.94	10.39	60.5			309	11
	Average of State				17.48	11.01	10.42	62.4	22.1	2,379	573	20

* Sent by State agricultural station.

Summary of results by States and counties—Continued.

MONTANA.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in—Juice.	Sucrose in—Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15384	M. Kercher	Custer	French	Oct. 14	14.65	10.69	10.15	73.0	16.0	2,141	737	26
15692	Chas. L. McKay	do	do	Oct. 21	13.41	9.95	9.45	74.2			1,005	37
15738	Wm. Strong	do	do	Oct. 22	13.48	9.65	9.16	71.5			2,300	81
15740	do	do	Golden Tankara	Oct. 22	11.68	8.50	8.07	72.9			1,660	59
16175	Wm. B. S. Higgins	do	French	Nov. 4	13.32	8.15	7.75	61.2			1,410	50
16176	do	do	do	Nov. 4	16.52	11.85	11.26	72.4			690	24
	Average				13.84	9.80	9.31	70.9	16.0	2,141	1,300	46
15089	Theodore J. Lynde	Gallatin	Kleinwanzlebener	Sept. 24	18.06	15.18	14.42	84.0			360	13
15090	do	do	do	Sept. 24	18.46	13.88	13.19	75.1			450	16
15366	do	do	do	Oct. 13	16.12	12.19	11.57	75.7			420	15
16200	do	do	do	Nov. 5	16.13	12.10	11.50	74.9	17.2	2,673	430	15
15607	Ella B. Lynde	do	do	Oct. 19	16.27	13.15	12.48	80.8	18.3	3,303	255	9
15608	do	do	do	Oct. 19	16.67	13.45	12.78	80.7	18.3	3,406	225	8
15609	C. H. Waterman	do	German	Oct. 19	16.77	13.00	12.35	77.4			625	22
15610	Wm. W. Wylie	do		Oct. 19	14.25	9.70	9.28	67.6			680	24
15830	Jno. W. Williams	do	Kleinwanzlebener	Oct. 24	19.67	14.40	13.68	73.2			420	15
15833	M. V. Huffman	do		Oct. 24	17.27	14.00	13.30	81.0			1,400	49
15834	Wm. F. Rea	do		Oct. 24	15.95	11.50	10.93	71.8			1,040	37
15906	Mary A. Black	do	Kleinwanglebener	Oct. 26	18.37	14.10	13.40	76.7	17.2	3,191	460	16
15907	do	do	do	Oct. 26	20.07	14.50	13.78	72.2	17.2	3,191	530	19
16057	John L. Wortman	do	do	Oct. 31	19.67	15.90	15.11	80.8			475	17
16059	Samuel Hobbs	do	do	Oct. 31	19.47	16.00	15.20	82.2			400	14
16117	Wm. Blarn	do	do	Nov. 2	17.61	13.75	13.06	70.1			770	27
16118	Theo. Norman	do	do	Nov. 2	19.01	13.60	12.92	71.5			490	17
16119	Jno. B. Bean	do	do	Nov. 2	18.01	13.50	12.83	75.0			920	33
16149	Thomas J. Lemon	do	do	Nov. 3	19.67	16.00	15.20	81.4	15.5	3,463	425	15
16150	James H. Lemon	do	do	Nov. 3	19.67	16.30	15.49	82.9	17.6	4,080	480	17
16151	J. D. Jones	do	do	Nov. 3	19.67	15.60	14.82	79.8	20.0	4,270	830	29
16201	Alphonse Bodgly	do	do	Nov. 5	21.27	16.50	15.68	77.6			210	7
16202	J. A. McElroy	do	do	Nov. 5	19.47	15.15	14.49	77.8	25.0	5,050	340	12
16245	Henry O. Gant	do	do	Nov. 7	19.77	15.50	14.73	78.4	22.9	4,772	610	22
16318	Lewis Lay	do	do	Nov. 10	19.17	16.20	15.39	84.5	12.9	3,028	930	33
16319	Geo. Comfort	do	do	Nov. 10	21.07	18.50	17.58	87.8			230	8
16529	Hugh C. McElroy	do	do	Nov. 20	19.97	15.60	14.33	78.1	25.0	5,215	320	11
16590	Joseph A. Pease	do		Nov. 29	23.67	18.20	17.28	76.9			750	26
15427	J. H. Nixon	do		Oct. 15	14.45	9.94	9.44	69.0			470	17

16058	Manhattan Malting Co	do	French	Oct. 31	20.47	17.15	16.39	83.3	20.0	4,898	830	29
	Average				18.54	14.48	13.75	77.6	19.0	3,888	559	20
15739	Quang, Hing & Co	Lewis and Clarke	Kleinwanzlebener	Oct. 22	19.39	15.80	15.01	81.5	3.8	839	650	23
15741	do	do	Vilmorin Improved	Oct. 22	20.09	16.75	15.91	83.4	3.8	909	410	14
	Average				19.74	16.28	15.46	82.5	3.8	874	530	19
15832	Ray F. Moon	Missoula	Vilmorin	Oct. 24	21.67	16.80	15.96	77.5			930	33
15835	do	do	Kleinwanzlebener	Oct. 24	20.77	16.50	15.67	79.9	24.0	5,126	640	23
	Average				21.22	16.65	15.82	78.7	24.0	5,126	785	28
15691	Geo. H. Casey	Silver Bow	Kleinwanzlebener	Oct. 21	16.61	12.10	11.50	72.9	22.2	3,357	470	17
	Average of State				17.99	13.93	13.23	76.8	17.6	3,495	675	25

NEBRASKA.

15505	Herman Th. Glampe	Antelope	Kleinwanzlebener	Oct. 17	14.88	11.75	11.16	79.0			685	24
15507	do	do	Vilmorin	Oct. 17	15.29	12.29	11.68	80.4			725	26
	Average				15.09	12.02	11.42	79.7			705	25
15508	Wm. F. Reed	Blaine		Oct. 17	15.08	11.89	11.30	78.8			1,550	55
15509	do	do		Oct. 17	10.68	6.58	6.25	61.6			1,810	64
16624	E. C. Carter	do	French	Dec. 7	17.74	14.90	14.15	84.0			835	
	Average				14.50	11.12	10.57	74.8			1,398	60
16170	A. W. Civish	Boxbutte	French	Nov. 4	22.04	18.00	17.10	81.7			880	31
16171	do	do	German	Nov. 4	20.44	16.15	15.34	79.0			860	30
	Average				21.24	17.08	16.22	80.4			870	31
16229	A. A. Hotchins	Chase	French	Nov. 6	20.89	16.30	15.49	78.0			1,710	60
16199	Mark W. Bailey	do	Kleinwanzlebener	Nov. 5	17.57	12.80	12.16	72.8			615	22
16625	L. C. Vroman	do	French	Dec. 7	19.54	16.00	15.20	81.3			360	13
16626	do	do	Desprez	Dec. 7	18.74	15.90	15.10	84.9			340	12
	Average				19.19	15.25	14.49	79.3			756	41
16591	L. Haumont	Custer	Kleinwanzlebener	Nov. 29	17.67	13.80	13.11	78.1	16.8	3,105	660	23
15693	do	do		Oct. 21	16.43	13.00	12.35	79.1	9.6	1,885	575	20
16169	M. W. Snyder	do	Vilmorin Improved	Nov. 4	17.22	11.20	10.65	65.0			735	26
16297	Jos. Jelinek	do	French	Nov. 9	15.35	11.50	10.93	74.9			1,000	35

Summary of results by States and counties—Continued.

NEBRASKA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16298	Jos. Jelinek	Custer	German	Nov. 9	15.65	11.50	10.93	73.5			1,180	42
16417	Henry Grantman	do	Vilmorin Improved	Nov. 14	19.07	13.50	12.83	70.8	17.9	2,911	1,270	45
	Average				16.90	12.42	11.80	73.6	14.8	2.634	903	32
15016	C. A. Elfstedt	Dawson	White	Sept. 8	15.31	11.91	11.31	77.9			430	15
16167	T. G. Fickensher	do	Bulteau Desprez	Sept. 4	12.82	8.25	7.84	64.4			1.665	59
16168	do	do	Kleinwanzlebener	Nov. 4	14.42	10.01	9.50	70.0			1.410	50
	Average				14.18	10.06	9.55	70.8			1,168	41
15051	Geo. Kermetz	Dodge		Sept. 19	12.11	10.58	10.05	87.4			1 240	44
15895	do	do		Oct. 26	17.37	13.00	12.35	74.8			1,000	35
	Average				14.74	11.79	11.20	81.1			1,120	40
16390	Anton Krause	Fillmore		Nov. 13	13.35	9.80	9.31	73.4			2,230	79
15425	A. J. Cole	Furnas	Vilmorin	Oct. 15	12.15	8.40	7.98	68.8			1,380	49
15475	do	do	do	Oct. 16	15.08	8.89	8.45	58.9			1.685	59
15646	H. Montgomery	do	do	Oct. 20	16.09	13.00	12.35	80.8			387	14
15956	Peter Fritzer	do	German	Oct. 28	16.65	12.00	11.45	72.1			1,310	46
15957	do	do	French	Oct. 28	15.45	10.65	10.02	69.0			1,420	50
	Average				15.08	10.59	10.05	69.9			1.236	44
15365	K. A. Schmidt	Gage	Vilmorin Improved	Oct. 13	13.92	10.55	10.03	75.3			960	34
16049	C. F. Klein	Harlan	Vilmorin	Oct. 31	13.85	8.80	8.36	64.3			1,640	58
16050	do	do	do	Oct. 31	15.65	11.40	10.83	75.4			1,480	52
	Average				14.75	10.10	9.60	69.9			1,560	55
15893	James Grant	Howard		Oct. 26	18.17	14.85	14.12	81.7			830	29
15894	do	do		Oct. 26	18.47	15.70	14.95	85.0			510	18
	Average				18.32	15.28	14.54	83.4			670	24
15029	Martin Black	Jefferson	Kleinwanzlebener	Sept. 14	10.79	6.05	5.75	56.0			1,850	65

15043	D. Douglas	Johnson	Bulteau Desprez	Sept. 17	15.81	12.83	12.19	81.1	....	....	1,880	66
15317	F. J. Kingsbury	Keya Paha	Kleinwanzlebener	Oct. 12	14.28	10.20	9.69	71.4	7.2	898	660	23
15319	......do	......do	Vilmorin Improved	Oct. 12	14.58	12.15	11.54	83.3	6.2	1,076	300	11
15839	S. H. Chalker	......do	German	Oct. 24	19.77	16.25	15.44	82.2	....	....	790	28
	Average				16.21	12.87	12.22	79.0	6.7	987	583	21
15318	Harvey S. Norton	Knox	Bulteau Desprez	Oct. 12	16.58	10.92	10.37	65.9	....	....	535	19
15947	Daniel Tenney	......do	Kleinwanzlebener	Oct. 27	22.17	17.30	16.43	78.0	....	....	495	17
	Average				19.38	14.11	13.40	72.0	....	....	515	18
15073	J. H. Hassinger	Logan	Vilmorin Improved	Sept. 22	17.63	13.93	13.23	79.0	7.61	1,435	820	29
16391	J. L. Ritchey	Madison	French	Nov. 13	14.15	11.25	10.69	79.5	19.6	3,007	555	20
15042	M. L. Herrington	Pawnee	......do	Sept. 17	12.32	8.37	7.95	67.9	....	....	1,540	54
15075	Wm. Taylor	Phelps	German	Sept. 23	14.51	10.91	10.36	75.2	....	....	1,680	59
15946	......do	......do	French	Oct. 28	16.25	12.90	12.25	79.4	13.6	2,388	735	26
15294	David L. Jones	......do	Vilmorin Improved	Oct. 12	16.39	13.18	12.52	80.4	....	....	900	32
	Average				15.72	12.33	11.71	78.3	13.6	2,388	1,105	43
15424	Mrs. Lizzie Elwood	Red Willow	Kleinwanzlebener	Oct. 15	14.95	11.05	10.50	73.7	....	....	1,050	37
16478	E. T. Libbee	Richardson	Vilmorin Improved	Nov. 17	20.67	16.65	15.82	80.6	21.3	4,923	380	13
16047	Wm. Doekring	Saline	French	Oct. 31	18.37	15.00	14.25	82.2	....	....	875	31
16048	......do	......do	German	Oct. 31	19.17	14.90	14.16	77.7	....	....	790	28
	Average				18.77	14.95	14.21	80.0	....	....	833	30
15154	J. S. Kiff	Sheridan	French	Oct. 3	14.03	10.82	10.27	77.3	....	....	1,185	42
16029	......do	......do	......do	Oct. 30	13.58	9.50	9.03	70.0	....	....	1,550	55
	Average				13.81	10.16	9.65	73.7	....	....	1,368	49
15506	S. C. Swigart	Sherman	German	Oct. 17	14.68	10.13	9.62	69.0	....	....	750	26
16120	T. M. Burke	......do	Kleinwanzlebener	Nov. 2	17.79	12.25	11.64	68.9	8.2	1,187	700	25
16121	......do	......do	Vilmorin Improved	Nov. 2	17.31	13.35	12.69	77.2	6.0	1,061	630	22
	Average				16.59	11.91	11.32	71.7	7.1	1,124	693	24
15110	Oscar A. Garton	Sioux	German	Sept. 28	15.47	10.76	10.22	69.5	....	....	260	9
15191	B. F. Thomas	......do	Bulteau Desprez	Oct. [illegible]	13.98	10.28	9.77	73.4	18.3	2,339	685	24
15948	H. T. Merriam	......do	Kleinwanzlebener	Oct. 28	21.27	17.10	16.24	80.4	15.5	3,652	290	10
	Average				16.91	12.71	12.08	74.4	16.9	2,996	412	14

Summary of results by States and counties—Continued.

NEBRASKA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15084	Christian Hekeler	Valley	Vilmorin Improved	Sept. 24	19.16	14.21	13.50	74.2			840	30
15363	Frank Grusel	Webster	Kleinwanzlebener	Oct. 13	12.92	10.05	9.55	77.3			870	31
15364	do	do	Vilmorin	Oct. 13	14.32	11.09	10.52	77.5			855	30
	Average				13.62	10.57	10.04	77.4			863	31
15784	J. F. Miller	York	Kleinwanzlebener	Oct. 28	17.37	13.65	12.97	78.6	16.6	3,053	629	22
	Average of State				16.22	12.37	11.67	75.3	13.2	2,351	975	35

NEVADA.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
16024	H. H. Springmeyer	Douglas	Kleinwanzlebener	Oct. 30	16.59	13.25	12.59	80.0			735	26
15145	H. H. Caryell	Elko	do	Oct. 2	16.39	13.40	12.73	81.7			630	22
15781	do	do	do	Oct. 28	17.67	14.60	13.87	82.6			465	16
	Average				17.03	14.00	13.30	82.2			548	19
15949	R. H. McDowell	Washoe	Kleinwanzlebener	Oct. 25	22.87	19.00	18.05	83.0	3.0	811	120	4
15950	do	do	do	Oct. 25	22.87	20.00	19.00	87.5	12.4	3,968	265	9
15951	do	do	do	Oct. 25	19.67	17.00	16.14	86.4	5.9	1,486	300	11
15952	do	do	do	Oct. 25	23.67	22.00	20.90	93.0	7.8	2,735	300	11
15953	do	do	Acollet rouge	Oct. 25	19.17	15.80	15.01	82.4	5.9	1,317	310	11
15954	do	do	Vilmorin Improved	Oct. 25	21.47	20.20	19.19	94.1	14.6	4,709	215	8
15955	do	do	Bulteau Desprez	Oct. 25	21.97	19.20	18.24	87.2	6.1	1,770	215	8
16521	do	do	Acollet rouge	Nov. 20	20.00	18.70	17.77	92.7	4.3	1,286	240	8
16522	do	do	Kleinwanzlebener	Nov. 20	22.50	20.60	19.57	90.9	8.8	2,825	305	11
16523	do	do	Kleinwanzlebener Improved	Nov. 20	20.50	18.90	17.96	91.4	16.3	4,827	340	12
16524	do	do	do	Nov. 20	20.50	19.25	18.29	93.1	6.5	1,997	240	8
16525	do	do	do	Nov. 20	19.97	17.80	16.91	88.9	4.0	1,084	235	8
16526	do	do	do	Nov. 20	21.67	18.90	17.96	87.2	2.9	840	145	5
16527	do	do	Vilmorin Improved	Nov. 20	20.77	18.90	17.96	91.0	12.4	3,656	320	11
16528	do	do	Bulteau Desprez	Nov. 20	20.17	18.30	17.38	90.7	6.3	1,793	280	10
	Average				21.18	18.97	18.02	89.3	7.8	2,340	255	9
	Average of State				20.47	18.10	17.20	88.0	7.8	2,340	314	11

NEW HAMPSHIRE.

16028	E. C. Daniels	Grafton	French	Oct. 30	15.28	12.25	11.64	80.0	14.8	2,486	540	19

NEW JERSEY.

15050	Wm. Young	Morris	Vilmorin Improved	Sept. 19	10.91	7.72	7.33	70.8	13.07	1,236	490	17

NEW MEXICO.

15063	H. B. Ashenfelter	Colfax	Lane's Imperial	Sept. 21	17.87	13.63	12.95	76.3	16.5	2,940	760	27
15888	do	do	do	Oct. 26	17.37	14.50	13.77	83.5	19.4	4,027	480	17
	Average				17.62	14.07	13.36	79.9	18.0	3,484	620	22
15112	C. W. Greene	Eddy	White	Sept. 28	16.97	12.41	11.79	73.1	14.7	2,287	420	15
15113	do	do	Kleinwanzlebener	Sept. 28	16.77	12.19	11.58	72.7	19.4	2,949	810	29
15114	do	do	Vilmorin Improved	Sept. 28	15.57	10.78	10.24	69.2	15.9	2,029	750	27
15889	Samuel Hughes	do	German	Oct. 26	16.15	11.50	10.93	71.2			1,500	53
15890	do	do	Hale's Improved	Oct. 26	18.97	13.25	12.59	70.0			570	20
15891	E. G. Shields	do	do	Oct. 26	15.37	12.50	11.88	72.0			1,111	39
15892	do	do	German	Oct. 26	23.67	18.75	17.81	79.2			510	18
16547	Maynard Sharpe	do	do	Nov. 21	29.64	22.50	21.37	75.9			690	24
16548	do	do	French	Nov. 21	29.64	23.00	21.85	77.6			550	20
	Average				20.31	15.21	14.45	73.4	16.7	2,422	768	27
16157	Alex. Kronig	Mora	German	Nov. 13	19.67	16.25	15.44	82.6	11.3	2,601	550	20
16158	do	do	French	Nov. 16	19.27	16.50	15.68	85 6	11.3	2,719	800	29
16447	Wm. Kronig	do	Kleinwanzlebener	Nov. 16	15.75	11.00	10.45	70.0			1,410	50
	Average				18.23	14.58	13.86	79.4	11.3	2,660	920	33
16461	Peter Roth	San Miguel	Kleinwanzlebener	Nov. 16	16.75	10.90	10.36	65.1			825	29
16462	H. T. Vaille	do	German	Nov. 16	20.17	14.40	13.68	71.4			950	34
16616	John Pendaries	do	French	Dec. 7	16.94	13.00	12.35	76.7			520	19
	Average				17.95	12.77	12.13	71.1			765	27
	Average of State				19.21	14.53	13.81	74.8	15.5	2,793	777	28

Summary of results by States and counties—Continued.

NEW YORK.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in—		Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Juice.	Beet.					
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16207	Henry Weber	Erie	French	Nov. 5	16.03	12.50	11.87	78.0			840	30
16208	do	do	do	Nov. 5	16.87	13.40	12.63	79.4			985	35
	Average				16.45	12.95	12.25	78.7			912	33
16261	Bryant W. Taylor	Genesee		Nov. 7	17.17	13.70	13.02	80.1			650	23
16423	David Marsh	Livingston	Bulteau Desprez	Nov. 16	13.23	9.25	8.79	69.9			1,120	40
	Average of State				15.83	12.21	11.58	76.8			899	32

NORTH DAKOTA.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in Juice.	Sucrose in Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Grams.	Ounces.
16292	Martin Plutzkow	Cavalier	Bulteau Desprez	Nov. 9	13.65	8.65	8.22	63.4			500	16
15104	J. R. McFadden	Dickey	French	Sept. 6	17.14	10.90	10.35	63.6	13.0	1,544	870	31
16247	do	do	do	Nov. 7	18.37	13.25	12.59	72.1	19.6	3,210	440	16
15898	Geo. O. Letson	do	Bulteau Desprez	Oct. 26	15.97	12.85	12.20	80.5			600	21
	Average				17.16	12.33	11.71	72.1	16.3	2,377	637	23
16027	W. B. Willey	La Moure	Bulteau Desprez	Oct. 30	18.59	14.00	13.31	75.3	16.3	2,945	606	21
15315	Matt. Fonstad	McIntosh	Kleinwanzlebener	Oct. 12	17.09	14.71	13.98	86.1			340	12
16291	P. Hagen	do		Nov. 9	21.47	15.25	14.49	71.0			285	10
16340	Julius Ericksen	do	German	Nov. 11	16.29	12.60	11.97	77.3			1,110	39
	Average				18.28	14.19	13.48	78.1			578	20
16063	A. S. Freegood	Nelson	Kleinwanzlebener	Oct. 31	19.57	13.90	13.20	71.0	15.2	2,573	215	8
15251	Wm. L. Hall	Stutsman		Oct. 9	12.03	8.18	7.77	68.1			1,405	50
15352	N. E. Farnsworth	do	Bulteau Desprez	Oct. 13	16.51	12.75	12.11	77.3			580	21
	Average				14.27	10.47	9.94	72.7			993	36
	Average of State				16.97	12.46	11.84	73.2	16.0	2,568	631	23

OHIO.

16421	S. B. Schrock	Ashtabula	French	Nov. 14	15.63	12.65	12.02	80.9	19.0	3,335	920	33
16563	J. F. Callender	do	Kleinwanzlebener	Nov. 24	18.13	15.10	14.35	83.3			485	17
	Average				16.88	1[illegible].88	13.19	82.1	19.0	3,335	703	25
15307	O. F. Benton	Auglaize	Kleinwanzlebener	Oct. 12	14.48	9.18	8.72	63.4			775	27
16178	do	do	do	Nov. 4	15.82	11.90	10.31	75.0	14.4	2,203	670	24
	Average				15.15	10.50	9.52	69.2	14.4	2,203	723	26
15246	Adam Stoner	Coshocton	Kleinwanzlebener	Oct. 9	15.43	11.83	11.24	76.9			520	18
15022	B. M. Castrell	Clark	Vilmorin	Sept. 14	14.59	10.47	9.95	71.2			1,825	64
15591	John Crabill	do	do	Oct. 19	14.15	9.85	9.34	68.2			1,150	41
15836	Geo. Elder	do	do	Oct. 24	13.25	9.00	8.55	67.8			590	21
15984	W. T. Otstot	do	do	Oct. 27	13.72	10.25	9.74	74.7			750	27
16203	Wm. Rice	do	do	Nov. 5	13.93	9.50	9.03	68.1			1,930	68
16313	R. K. Hunt	do	do	Nov. 10	18.67	12.75	12.11	68.3			605	21
16438	Jno. Woodman	do	Kleinwanzlebener	Nov. 16	18.63	14.40	13.68	77.3			960	34
	Average				15.28	10.90	10.34	70.8			1,116	39
15904	Wm. Yantz	Erie	Vilmorin	Oct. 26	15.65	11.65	11.06	74.4	21.8	3,239	1,080	38
16236	John W. Sargeant	do	Vilmorin Improved	Nov. 6	17.29	13.65	12.97	78.9			355	12
16312	A. A. Storrs	do	Conical improved	Nov. 9	15.97	13.25	12.59	83.0	23.7	4,472	1,100	39
16361	Wm. Atwater	do	Vilmorin Improved	Nov. 13	19.39	16.70	15.87	86.1			515	18
16486	Jacob Bach	do	Kleinwanzlebener	Nov. 19	18.23	14.55	13.82	79.8	12.0	2,390	750	26
16487	do	do	French conical	Nov. 19	16.23	13.80	13.11	85.0	22.0	4,422	1,075	38
16488	do	do	Vilmorin	Nov. 19	16.33	13.30	12.64	81.4	12.5	2,320	720	25
16489	do	do	White imperial	Nov. 19	13.53	10.60	10.07	79.1	24.0	3,451	860	30
16490	do	do	Bulteau Desprez	Nov. 19	16.03	12.50	11.88	77.9			1,175	42
16491	do	do	Red Croatian	Nov. 19	11.83	7.20	6.85	60.9	14.0	1,051	650	23
16492	do	do	German	Nov. 19	10.83	6.40	6.08	59.1	15.0	974	630	22
16493	F. E. White	do	Bulteau Desprez	Nov. 19	13.53	9.55	9.07	70.6	21.8	2,579	705	25
16520	Geo. Rose Kelly	do		Nov. 19	14.63	11.35	10.78	77.6			1,875	67
16551	H. C. Norton	do	Bulteau Desprez	Nov. 23	15.51	11.70	11.11	76.1			590	21
16581	Thad. Larch	do	German	Nov. 27	14.38	9.85	9.36	68.5			520	18
16601	C. T. Steen	do	Bulteau Desprez	Nov. 29	18.89	15.35	14.58	81.2			2,050	72
16627	Jacob Bulduff	do	do	Dec. 7	16.24	13.00	12.35	80.0			1,480	52
16316	Geo. W. Ferguson	do	Kleinwanzlebener	Nov. 10	17.77	14.35	13.63	80.8	15.8	3,651	480	17
	Average				15.68	12.15	11.46	76.7	18.3	2,855	923	32
16177	C. H. Chase	Geauga	Kleinwanzlebener	Nov. 4	17.84	14.00	13.30	78.5	13.1	2,468	535	19

Summary of results by States and counties—Continued.

OHIO—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16613	Geo. W. Brown	Hancock		Dec. 2	21.11	14.55	13.82	69.0			310	11
16614	do	do	German	Dec. 2	24.21	21.15	20.19	87.4			550	19
16615	J. H. Hickerson	do		Dec. 2	25.55	20.20	19.19	79.2			785	28
16645	B. H. Rickard	do	Kleinwanzlebener	Dec. 27	17.67	12.70	12.06	71.8			570	20
	Average				22.14	17.15	16.32	76.9			554	19
15590	Wm. S. Cox	Harrison	Vilmorin	Oct. 19	14.45	11.10	10.55	76.8			855	30
15985	Harrison Adams	do	do	Oct. 29	17.23	12.85	12.22	74.6			1,385	49
16314	J. B. McFadden	do	French	Nov. 10	15.67	14.50	13.78	92.6			810	28
	Average				15.78	12.82	12.18	81.3			1,017	36
16622	B. F. Pontious	Henry		Dec. 7	15.52	11.75	11.16	75.7			3,100	108
16623	do	do		Dec. 7	16.42	12.00	11.40	73.1			2,450	87
	Average				15.97	11.88	11.28	74.4			2,775	98
16404	H. P. Adams	Loraine	Kleinwanzlebener	Nov. 14	13.75	10.05	9.55	73.1			840	30
16405	do	do	French	Nov. 14	18.17	14.80	14.06	81.5	17.4	3,598	505	18
	Average				15.96	12.43	11.81	77.3	17.4	3,598	673	24
16455	Jno. W. Price	Licking	French	Nov. 16	17.55	12.10	11.50	69.0			610	22
16456	do	do	Kleinwanzlebener	Nov. 16	17.35	12.10	11.50	69.7			670	24
	Average				17.45	12.10	11.50	69.4			640	23
16125	E. G. Stockman	Marion		Nov. 2	16.09	12.25	11.64	76.1			480	17
15657	Leonard Young	Meigs	Kleinwanzlebener	Oct. 2	12.28	9.55	9.07	77.8	20.3	2,566	535	19
16064	Elmer Somers	Montgomery		Oct. 31	18.87	14.30	13.58	75.7	7.8	1,448	615	23
16549	Dennis Dayer	do		Nov. 23	17.43	13.80	13.11	79.1			840	30
16550	do	do		Nov. 23	14.61	11.00	10.45	75.3			1,390	49
	Average				16.97	13.00	12.38	76.7	7.8	1,448	948	31
16574	S. Curtis	Morrow	Kleinwanzlebener	Nov. 27	18.29	16.00	15.20	86.3	17.4	4,003	680	24

16575	do	do	Vilmorin	Nov. 27	21.89	18.60	17.67	85.0	18.5	5,017	570	20
	Average				20.09	17.30	16.44	85.7	18.0	4,510	625	22
16438	John Woodman	Ottawa	Kleinwanzlebener	Nov. 16	18.63	14.40	13.68	77.3			960	34
15019	Nathan Varner	Paulding	Bulteau Desprez	Sept. 10	9.69	6.00	5.70	52.0			1,260	45
15024	Chas. S. Seitz	Seneca	Vilmorin, Improved	Sept. 14	15.91	13.23	12.57	83.2	24.5	4,623	460	16
15028	do	do	Mangelwurzel	Sept. 14	7.46	3.61	3.43	48.4			1,100	39
	Average				11.69	8.42	8.00	65.8	24.5	4,623	780	28
15826	D. H. Wilder	Trumbull	Kleinwanzlebener	Oct. 24	16.27	13.55	12.88	83.2	12.9	2,494	755	27
15827	do	do	Vilmorin	Oct. 24	15.65	10.60	10.07	67.7			1,020	36
16257	do	do	Kleinwanzlebener	Nov. 7	18.37	15.25	14.49	83.0	15.1	3,277	340	12
16258	do	do	Vilmorin Improved	Nov. 7	17.37	14.85	14.11	85.5	22.2	4,333	330	12
16259	do	do	French	Nov. 7	17.17	13.65	12.97	79.5	20.5	3,853	520	18
16392	W. H. Bushnell	do	do	Nov. 13	16.77	12.85	12.21	76.6	13.8	2,754	475	17
16204	Chas. N. Yorks	do	do	Nov. 5	17.67	14.25	13.44	80.7	17.4	3,431	980	35
16315	Albert Barber	do	Vilmorin Improved	Nov. 10	18.77	15.90	15.11	84.7	19.6	4,526	620	22
16395	Wm. King	do	French	Nov. 14	16.87	13.55	12.87	80.3			900	32
16582	J. A. Betteker	do	Vilmorin	Nov. 27	16.99	13.70	13.01	80.6			1,010	36
	Average				17.19	13.82	13.12	80.2	17.4	3,524	695	25
15986	Louise F. Fullmer	Wyandot	Kleinwanzlebener	Oct. 29	16.83	12.85	12.22	76.3			1,820	64
	Average of State				16.23	11.93	11.33	73.5	16.9	3,055	882	31

OKLAHOMA.

15004	F. M. Ferris	Oklahoma	White	Aug. 20	12.58	6.71	6.37	53.3			1,815	48

OREGON.

15222	Herman Benke	Benton	German	Oct. 8	17.49	13.88	13.18	79.3			370	13
15605	J. J. Nye	do	do	Oct. 19	16.97	13.30	12.63	78.4	7.5	1,340	555	20
16612	C. J. Bishop	do	Bulteau Desprez	Dec. 2	17.61	15.40	14.63	87.5	16.6	3,835	335	12
16596	G. H. Rosebrook	do	Kleinwanzlebener	Nov. 29	16.89	14.05	13.35	83.1	6.5	1,306	300	11
16659	Henry Denlinger, jr	do		Dec. 21	17.64	15.05	14.30	85.4	25.9	5,798	1,580	56
	Average				17.32	14.34	13.71	82.8	14.12	3,069	628	22

Summary of results by States and counties—Continued.

OREGON—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15187	Thomas Daniels	Clackamas		Oct. 6	22.68	19.88	18.88	87.6	16.7	4,993	500	18
16495	O. P. Yoder	do	Kleinwanzlebener	Nov. 19	16.83	14.55	13.82	86.5			105	4
16557	Richard Scott	do	do	Nov. 23	15.91	12.25	11.64	77.0			1,155	41
	Average				18.47	15.56	14.78	84.2	16.7	4,993	586	21
15838	Clarence Reed	Columbia	Kleinwanzlebener	Oct. 24	19.67	16.50	15.67	83.9	17.0	4,036	275	10
16153	do	do	do	Nov. 3	19.67	15.60	14.82	79.8	20.0	4,270	830	29
16317	J. C. Johnson	do		Nov. 10	16.17	13.90	13.21	86.0	11.5	2,358	535	19
	Average				18.50	15.30	14.56	81.7	16.2	3,554	546	19
16569	J. M. Perkins	Coos	Kleinwanzlebener	Nov. 27	16.31	13.00	12.35	80.8			1,030	36
16570	Matt. Kerrigan	do	Vilmorin	Nov. 27	17.31	14.50	13.77	83.8			600	21
16572	do	do	Kleinwanzlebener	Nov. 27	17.71	14.65	13.92	80.5			830	29
16571	Jno. B. Fox	do		Nov. 27	19.31	16.80	15.96	87.0			975	34
16573	T. T. Smith	do	Vilmorin Improved	Nov. 27	17.51	13.85	13.16	79.1			865	31
	Average				17.63	14.56	13.83	82.6			860	30
15149	W. L. Tower	Douglas	German	Oct. 3	21.03	17.74	16.85	84.3			340	12
15032	Edward Albright	Jackson		Sept. 15	22.57	18.94	17.99	83.9	17.8	4,849	570	20
15117	J. G. Stevenson	Lane	Vilmorin Improved	Sept. 28	15.67	12.15	11.54	77.5	6.5	1,049	115	4
16025	Wm. N. Crow	do		Oct. 30	18.09	14.05	13.36	77.7			565	20
16152	H. C. Perkins	do		Nov. 3	17.17	13.95	13.25	81.2			475	17
15905	J. H. Crow	do		Oct. 26	20.68	17.50	16.63	84.6	11.8	2,995	230	8
16356	C. J. Dodd	do	French	Nov. 11	17.99	15.10	14.35	83.9			815	29
16648	Lafayette Martin	do		Dec. 21	15.35	12.67	12.05	82.5			1,100	39
	Average				17.49	14.24	13.53	85.4	9.2	2,018	550	20
16126	John Wither	Linn		Nov. 2	17.81	14.15	13.42	79.5			180	6
15375	Jacob Raber	Marion		Oct. 14	16.17	12.35	11.73	76.2			1,365	48
15606	J. Voorhees	do		Oct. 19	16.87	14.45	13.73	85.7	20.3	4,332	560	20
	Average				16.52	13.40	12.73	81.1	20.3	4,332	962	34

16483	James Douglas	Polk	German	Nov. 18	15.17	12.10	11.50	79.8			880	31
15031	J. E. David	Sherman		Sept. 15	18.77	13.55	12.86	72.2			435	15
15288	J. H. Logan	Umatilla	French	Oct. 10	18.69	15.12	14.36	80.9			395	14
16585	W. R. Wise	Union		Nov. 27	17.39	14.10	13.40	81.0			980	35
16586	do	do		Nov. 27	17.59	14.55	13.82	82.6			1,130	40
	Average				17.49	14.32	13.61	81.8			1,055	35
15133	J. H. Rinck	Washington	Kleinwanzlebener	Oct. 1	14.77	12.67	12.04	85.8	12.8	2,401	250	9
16231	A. N. Ault	do	Vilmorin	Nov. 6	18.29	15.00	14.25	82.0	15.2	3,204	430	15
16584	do	do	do	Nov. 27	14.38	9.80	9.31	68.3	18.3	2,467	1,365	48
	Average				15.48	12.49	11.86	80.7	15.4	2,690	681	24
	Average of State				17.72	14.57	13.84	82.2	15.6	3,480	644	23

PENNSYLVANIA.

16445	W. W. Claypool	Armstrong		Nov. 16	16.03	11.85	11.26	73.9			780	21
16463	I. N. Meals	Butler	Vilmorin Improved	Nov. 16	19.67	16.35	15.53	83.1	16.3	3,798	490	17
16418	T. F. Penman	Lackawanna	Erfurt Giant	Nov. 14	17.95	12.00	11.40	66.9			650	23
16419	do	do	Red French	Nov. 14	24.17	20.65	19.62	85.4			366	12
	Average				21.06	16.32	15.51	77.5			508	18
16030	Frank E. Shannon	Venango	Bulteau Desprez	Oct. 30	15.08	11.00	10.45	72.9	21.8	2,998	1,060	37
15240	G. W. Bauer	Warren	German	Oct. 9	15.53	12.58	11.95	81.0	8.7	1,519	640	23
15241	do	do	French	Oct. 9	17.03	13.42	12.81	78.9			400	14
	Average				16.28	13.00	12.38	79.9	8.7	1,519	520	19
	Average of State				17.78	13.98	13.29	78.7	15.6	2,772	626	22

SOUTH DAKOTA.

15776	A. H. Hall	Aurora	Desprez	Oct. 23	16.35	11.50	10.93	73.0			785	28
15778	do	do	French	Oct. 23	14.55	10.25	9.74	76.4			980	35
15874	Geo. E. Babcock	do	Kleinwanzlebener	Oct. 26	16.65	12.00	11.45	72.1			950	34
15875	do	do	do	Oct. 26	16.35	11.25	10.65	68.8			1,670	59

Summary of results by States and counties—Continued.

SOUTH DAKOTA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16473	D. G. Townsend	Aurora	French	Nov. 17	18.57	13.00	12.35	70.00	19.6	3,058	1,017	36
16474	do	do	German	Nov. 17	17.97	13.15	12.50	73.20	23.5	3,878	1.000	35
	Average				16.74	11.86	11.27	70.90	21.55	3,468	1,070	37
15810	E. W. Crouch	Beadle	Desprez	Oct. 24	16.67	12.60	11.99	75.60	9.0	1,470	1,080	38
15840	C. A. Blake	do	do	Oct. 24	18.47	14.40	13.68	77.90			785	28
15861	A. W. Wilmarth	do	Kleinwanzlebener	Oct. 26	19.27	15.20	14.45	78.90	23.0	4,728	330	12
15873	Jno. H. Miller	do	Mette	Oct. 26	20.07	16.50	15.67	82.20			865	31
16017	A. W. Wilmarth	do	do	Oct. 30	22.09	13.03	12.64	60.20	17.4	2,389	180	6
16217	W. E. Moxon	do		Nov. 6	12.88	8.20	7.79	63.70			1,435	51
16222	Albert Patten	do	Vilmorin	Nov. 6	13.28	9.65	9.17	72.70			1,570	55
16223	do	do	do	Nov. 6	11.88	8.40	7.98	70.70			1,740	61
15339	Wilfred Baker	do		Nov. 10	16.41	13.93	13.23	85.00			890	31
16470	C. W. Barringer	do	Mette	Nov. 16	22.67	17.80	16.91	78.60			405	14
16471	J. A. Colcord	do	do	Nov. 16	22.67	20.15	19.14	90.50			255	8
16472	S. B. Melville	do	Kleinwanzlebener	Nov. 16	24.27	19.65	18.67	81.00			425	15
16567	B. E. McIlvaine	do	Desprez	Nov. 27	15.29	10.50	9.98	68.60			1,030	36
16568	Frank Campbell	do		Nov. 27	16.09	11.35	10.79	70.50			970	34
	Average				18.00	13.67	13.00	75.90	16.5	2,862	854	30
15863	Louis Schneider	Bonhomme		Oct. 26	14.95	10.00	9.50	66.90			1.345	48
16020	P. D. Davis	Brookings	Bulteau Desprez	Oct. 30	18.39	13.95	13.26	75.80	8.3	1,505	400	14
16422	Agricultural station	do	Vilmorin	Nov. 16	15.83	12.60	11.97	79.70	10.8	1,859	685	24
16429	do	do	Bulteau Desprez	Nov. 16	16.63	13.00	12.35	78.20	14.2	2,476	605	21
16430	do	do	Kleinwanzlebener	Nov. 16	17.43	13.80	13.11	79.20	10.7	2,005	715	25
16431	do	do		Nov. 16	16.03	12.35	11.83	77.00	16.3	2,658	525	19
	Average				16.86	13.12	12.50	77.80	12.06	2,100	586	21
15100	S. W. Narregang	Brown	Vilmorin	Sept. 26	16.56	13.02	12.37	78.60			983	35
15101	do	do	do	Sept. 26	17.16	12.99	12.34	75.90			360	13
15194	do	do	French	Oct. 7	13.58	9.76	9.27	71.80			720	26
15195	do	do	do	Oct. 7	15.08	9.86	9.37	65.70			390	14
15196	do	do	Vilmorin	Oct. 7	16.08	11.27	10.70	70.10	15.8	2,139	480	17
15197	do	do	Kleinwanzlebener	Oct. 7	15.58	11.83	11.24	75.90			250	9
15559	do	do	Vilmorin	Oct. 19	18.97	15.60	14.82	82.20	9.8	2,172	410	15
15563	do	do	Bulteau Desprez	Oct. 19	16.65	12.15	11.54	73.00	16.8	2,555	410	15

15648	do	do	Vilmorin	Oct.	20	14.08	10.10	9.60	71.70	21.4	2,658	550	19
15674	do	do	do	Oct.	21	16.01	11.95	11.35	74.60	20.2	3,089	551	19
15675	do	do	do	Oct.	21	16.11	12.00	11.40	74.50	23.0	3,618	479	17
15676	do	do	Kleinwanzlebener	Oct.	21	15.21	11.30	10.74	74.30	20.2	2,909	438	15
15677	do	do	Vilmorin	Oct.	21	17.73	13.80	13.11	77.80			614	22
15816	do	do		Oct.	24	21.97	16.50	15.67	75.10			323	11
15876	do	do	Vilmorin	Oct.	26	15.95	11.00	10.45	69.00			1,607	57
16013	do	do	do	Oct.	30	15.08	11.00	10.45	72.80	17.0	2,334	408	14
16015	do	do	Kleinwanzlebener	Oct.	30	18.59	15.80	15.01	84.90			250	9
16016	do	do	Vilmorin	Oct.	30	17.08	12.10	11.49	70.40	21.8	3,181	471	17
16019	do	do		Oct.	30	12.68	8.50	8.07	67.00			715	25
16159	do	do	Vilmorin	Nov.	4	16.22	11.95	11.36	73.50			350	12
16160	do	do	Bulteau Desprez	Nov.	4	16.22	11.30	10.74	69.96			355	12
16161	do	do	Vilmorin	Nov.	4	15.72	11.20	10.65	71.20	21.3	2,912	230	8
16162	do	do	Kleinwanzlebener	Nov.	4	20.44	15.90	15.11	77.80	17.6	3,733	590	21
16334	do	do	Bulteau Desprez	Nov.	10	17.69	14.44	13.68	81.40	19.2	3,859	365	13
16335	do	do	Kleinwanzlebener	Nov.	10	20.29	15.65	14.87	77.10	20.3	3,262	205	7
16336	do	do	do	Nov.	10	21.19	16.20	15.39	76.50	14.4	3,104	250	9
16337	do	do	do	Nov.	10	21.49	16.70	15.87	77.70			260	9
16338	do	do		Nov.	10	19.79	12.55	11.92	63.40			470	17
16372	do	do	Kleinwanzlebener	Nov.	13	19.49	15.40	14.63	79.00	20.3	4,235	270	10
16400	do	do	do	Nov.	14	19.77	16.10	15.30	81.40	20.3	4,561	428	15
16402	do	do	Vilmorin Improved	Nov.	14	19.47	14.55	13.82	75.20			528	19
16403	do	do	Kleinwanzlebener	Nov.	14	21.67	18.10	17.20	83.60			178	6
16560	do	do	Vilmorin Improved	Nov.	27	18.63	15.65	14.38	84.20			400	14
16561	do	do	do	Nov.	27	15.93	11.40	10.83	71.50	21.4	2,992	170	6
16333	do	do	do	Nov.	10	18.49	14.60	13.87	78.90	9.8	1,936	500	18
15404	J. A. Black	do	Vilmorin Improved	Oct.	15	16.87	15.51	14.64	91.90	19.4	4,741	480	17
15808	Robt. M. McCordie	do		Oct.	23	18.67	13.85	13.16	74.20	21.8	3,800	585	21
15815	Nelson Washburn	do	Kleinwanzlebener	Oct.	24	17.17	12.75	12.12	74.20	11.5	1,865	275	10
15862	A. J. Allen	do	Imperial	Oct.	26	17.67	13.25	12.59	75.00			650	23
15865	O. C. Matteson	do	Vilmorin	Oct.	26	16.95	12.00	11.45	70.80	13.5	1,967	530	19
16100	Chas. R. Case	do	Bulteau Desprez	Nov.	2	18.81	14.25	13.53	75.80	24.0	4,445	570	20
16103	Chas. R. Kimball	do	do	Nov.	2	22.31	16.50	15.67	74.00	25.0	5,235	540	19
16104	do	do	do	Nov.	2	20.31	14.35	13.63	72.60	25.0	4,590	550	19
16163	E. T. Scott	do		Nov.	4	13.72	9.35	8.88	68.10			1,175	42
16186	Chas. L. Smith	do		Nov.	5	16.43	12.20	11.59	74.20			565	20
16343	C. I. Edson	do	Kleinwanzlebener	Nov.	11	19.99	15.15	14.39	75.80	14.3	2,816	335	12
16344	do	do	Vilmorin	Nov.	11	21.49	17.05	16.20	79.30			355	12
16371	Wm. F. Crockard	do	Bulteau Desprez	Nov.	13	21.09	16.90	16.06	80.10	16.8	3,899	410	15
15411	Daniel Wample	do	French	Oct.	15	18.67	13.45	12.84	72.00	25.0	4,145	360	13
	Average					17.81	13.69	12.76	76.86	18.8	3,313	476	17
15809	Simon Morgan	Brule	Desprez	Oct.	24	20.67	17.55	16.67	84.90			625	22
15814	J. B. Smith	Buffalo	Mangelwurzel	Oct.	24	13.75	9.25	8.79	67.30	6.3	672	740	26
16018	Wm. Cruson	do	Desprez	Oct.	30	19.79	15.10	14.35	76.30	12.2	2,413	500	18
16218	W. H. Andrews	do		Nov.	6	15.08	9.75	9.26	64.60			780	28
	Average					16.20	11.37	10.80	70.00	9.25	1,543	673	24

Summary of results by States and counties—Continued.

SOUTH DAKOTA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per. ct.	*Per. ct.*	*Per. ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15813	Geo. Z. Richards	Butte	Oxnard	Oct. 24	20.67	15.70	14.96	76.00			240	8
16428	Andrew Craig	do	Desprez	Nov. 16	20.03	15.80	15.01	78.90			475	17
16606	do	do	do	Nov. 30	21.03	17.70	16.81	84.10			640	23
	Average				20.58	16.40	15.58	79.60			450	16
16051	Myron T. Wolverton	Campbell	Bulteau Desprez	Oct. 31	17.27	13.25	12.59	76.60	13.3	2,314	645	23
15150	Jesse E. Nale	Charles Mix	French	Oct. 3	18.83	15.64	14.86	83.00	17.2	3,836	330	12
15500	do		German	Oct. 17	20.79	16.56	15.82	79.70	11.9	2,693	315	11
	Average				19.56	16.10	15.34	82.40	14.55	3,264	322	11
15168	John Jones	Clark		Oct. 5	16.28	11.42	10.85	70.10			670	24
16262	A. Grover	do	French	Nov. 7	17.67	13.80	13.11	78.10			400	14
	Average				16.98	12.61	11.97	74.30			535	19
15127	N. G. Swanson	Clay	Kleinwanzlebener	Sept. 29	17.69	13.34	12.67	71.70			315	11
15248	L. A. Anderson	do	Vilmorin	Oct. 9	18.13	14.32	13.61	78.60			765	27
15250	do	do		Oct. 9	16.93	13.10	12.46	77.00			785	28
15926	R. S. Gaylord	do		Oct. 27	16.34	13.35	12.69	81.70			1,030	36
15927	do			Oct. 27	15.54	12.50	11.88	80.40			1,320	47
	Average				16.93	13.32	12.65	78.90			843	30
15457	Peter Lappire	Codington	White	Oct. 16	15.28	11.48	10.91	75.10			630	22
15872	John Twining	Custer	Bulteau Desprez	Oct. 26	20.97	15.25	14.50	72.70	16.1	2,904	390	14
16052	Thomas Scholfield	Davieson	do	Oct. 31	17.17	13.75	13.06	80.00			1,220	43
16053	do	do	do	Oct. 31	17.77	13.65	12.97	76.80			1,290	46
16246	J. C. Clapham	do	do	Nov. 7	19.17	15.95	15.15	83.20	13.7	3,118	640	23
	Average				18.03	14.45	13.73	80.10	13.7	3,118	1,050	37
15679	Joshua Gower	Day	German	Oct. 21	21.13	16.30	15.49	77.10	13.0	2,813	375	13
16164	August Krause	do	French	Nov. 4	18.24	13.70	13.01	75.10			440	16
16189	E. O. Esget	do	Kleinwanzlebener	Nov. 5	16.43	12.05	11.42	73.30	13.0	1,968	525	19

16459	E. T. Odegard	do	Bulteau Desprez	Nov. 16	19.27	14.75	14.01	74.10	17.4	3,263	225	8
16014	C. E. Wheeler	do	Kleinwanzlebener	Oct. 30	22.79	15.85	15.06	70.00			565	20
	Average				19.57	14.53	14.80	73.52	14.5	2,681	426	15
16188	C. H. Lester	Deuel	Bulteau Desprez	Nov. 5	16.43	12.90	12.26	78.30	7.5	1,299	695	25
15119	L. B. Greene	Douglas	Kleinwanzlebener	Sept. 29	11.54	6.42	6.10	55.90			1,290	46
16289	do	do	do	Nov. 9	15.65	10.30	9.79	65.80			1,170	41
15779	N. R. Wetlaufer	do	Bulteau Desprez	Oct. 23	15.87	12.85	12.21	81.00			595	21
	Average				14.35	9.86	9.37	68.70			1,018	36
15958	Lester Crane	Edmunds	Desprez	Oct. 28	18.27	13.90	13.21	76.08			445	16
16190	R. Barrows	do	do	Nov. 5	21.17	15.30	14.54	72.30	10.4	1,973	310	11
16290	Henry Mundt	do	do	Nov. 9	18.87	14.15	13.44	75.00			242	9
	Average				19.43	14.45	13.63	74.60	10.4	1,923	332	12
15812	Henry Rose	Fall River	French	Oct. 24	16.17	13.85	13.16	85.60	19.0	3,867	590	21
15405	R. Jungwirth	Faulk	French	Oct. 15	23.59	17.76	16.88	75.40	11.0	2,575	615	22
15407	do	do	Kleinwanzlebener	Oct. 15	23.57	19.27	18.31	81.70	10.2	2,755	385	14
15410	do	do	Imperial	Oct. 15	23.57	16.56	15.73	70.30	11.0	2,196	400	14
15406	Frank Jungwirth	do	do	Oct. 15	21.27	16.39	15.57	77.00	11.5	2,489	600	21
16098	S. S. Wentworth	do	Desprez	Nov. 2	15.29	10.50	9.55	69.30	20.8	2,596	1,095	39
16485	do	do	Champion	Nov. 17	14.07	9.80	9.31	69.60	24.5	2,864	1,275	45
16406	Martin Bellin	do		Nov. 14	17.67	13.40	12.73	75.90			788	28
	Average				18.43	14.38	14.01	74.00	14.8	2,580	737	31
15973	Thomas Street	Grant	Bulteau Desprez	Oct. 29	14.43	9.35	8.88	64.80	17.0	1,769	415	15
16101	P. E. Higgins	Hamlin	German	Nov. 2	15.89	11.10	10.55	69.80			430	15
16102	do	do		Nov. 2	16.79	11.75	11.16	70.00			405	14
	Average				16.34	11.43	10.85	69.90			417	14
15562	John Lovelace	Hutchinson	Kleinwanzlebener	Oct. 19	17.37	13.25	12.59	76.30	20.3	3,518	665	24
15566	S. W. Mills	do	Vilmorin	Oct. 19	16.05	11.75	11.16	73.20			860	30
16388	Jno. M. Downer	do	Desprez	Nov. 23	15.25	11.10	10.55	72.80			565	20
	Average				16.22	12.03	11.43	74.16	20.3	3,518	696	25
15017	Wm. E. Hammer	Hyde	French	Sept. 9	17.87	13.88	13.19	77.60			750	26
15091	Jacob Myers	do		Sept. 25	15.61	10.46	9.94	67.00			830	29
15106	Henry Nelson	do	Kleinwanzlebener	Sept. 28	22.69	17.22	16.36	75.90			670	24
16389	John Shearon	do	Desprez	Nov. 13	19.67	15.25	14.59	77.50	18.3	3,709	285	10
	Average				18.96	14.20	13.52	77.20	18.3	3,709	634	22

Summary of results by States and counties—Continued.

SOUTH DAKOTA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16559	I. A. Tillery	Jerauld		Nov. 24	17.53	13.15	12.49	75.00			580	21
15286	W. A. Palmer	Kingsbury	Desprez	Oct. 10	13.28	7.66	7.28	57.60			1,150	41
15287	do	do	do	Oct. 10	15.68	10.73	10.19	68.30			1,000	35
15565	Walter Thornber	do	do	Oct. 19	17.77	13.35	12.68	76.40	19.6	3,428	550	19
15747	F. W. Collins	do	Kleinwanzlebener	Oct. 22	17.90	13.05	12.40	76.30			700	25
15866	D. M. Maxson	do	do	Oct. 26	20.27	15.75	15.01	77.70			420	15
15896	W. H. French	do	do	Oct. 26	15.65	11.45	10.88	73.20			725	26
15897	J. S. French	do	do	Oct. 26	18.37	13.50	12.83	73.50			515	18
	Average				16.97	12.21	11.60	71.90	19.6	3,428	709	25
15124	Wm. Whitmore	Lake	French	Sept. 29	14.87	9.97	9.47	67.10			630	22
15125	do	do	German	Sept. 29	16.57	11.79	11.20	71.20			620	22
15131	Richard Lawless	do	Kleinwanzlebener	Oct. 1	14.85	10.89	10.34	73.30			1,265	45
15141	Fred. Kruger	do	Vilmorin Improved	Oct. 2	14.68	11.30	10.73	77.00	23.0	3,431	760	29
15142	J. J. Kramer	do	Kleinwanzlebener	Oct. 2	17.09	14.28	13.57	83.40	16.4	3,313	320	11
15147	F. D. Gilbert	do		Oct. 3	18.43	13.87	13.17	74.70	12.0	2,136	485	17
15163	Henry H. Jones	do	German	Oct. 3	17.11	13.15	12.49	82.80			910	32
15266	M. W. Daily	do	French	Oct. 10	16.19	12.61	11.98	77.80			460	16
15268	Dr. J. R. Jones	do		Oct. 10	14.58	10.96	10.41	75.00			1,475	52
15929	do	do	German	Oct. 27	19.14	14.50	13.78	75.80	19.6	3,693	335	12
15314	S. C. Saxby	do	French	Oct. 12	13.28	8.84	8.40	66.60			695	25
15353	H. P. Smith	do	Vilmorin	Oct. 13	16.91	12.46	11.85	73.30			450	16
15354	F. D. Fitts	do	Kleinwanzlebener	Oct. 13	16.11	12.35	11.74	76.70			860	30
15972	do	do	do	Oct. 29	16.03	11.55	10.97	72.10			570	20
15355	T. H. Odell	do	French	Oct. 13	19.11	14.21	13.50	74.40	17.8	3,232	270	10
15378	B. C. Kennedy	do	Kleinwanzlebener	Oct. 14	19.17	14.00	13.30	72.90			585	21
15408	F. L. Heeley	do	French	Oct. 15	17.77	13.21	12.55	74.30			460	16
15409	Wm. Vanderhoof	do	Kleinwanzlebener	Oct. 15	19.27	14.56	13.83	75.40			440	16
15458	D. T. Scott	do	do	Oct. 16	17.59	13.61	12.93	77.40			490	17
16148	do	do	French	Nov. 3	16.77	12.85	12.21	76.60	23.5	4,277	450	16
15499	Jno. Whitmore	do	do	Oct. 19	15.38	11.61	11.03	75.50			400	14
15556	Harry W. Fintzel	do	Kleinwanzlebener	Oct. 19	13.15	9.09	9.40	75.30	22.9	2,927	517	18
15557	Jos. C. Welling	do	do	Oct. 19	15.55	11.40	10.83	73.30			775	27
15558	D. McKinnon	do	French	Oct. 19	14.65	11.25	10.68	76.80			1,030	36
15560	Malcolm L. Clark	do	Kleinwanzlebener	Oct. 19	14.85	10.50	9.98	70.70	22.4	2,852	720	25
15561	J. McGillnay	do	do	Oct. 19	12.45	8.65	8.22	69.50			1,380	49
15564	M. L. Guecker	do	do	Oct. 19	14.85	10.00	9.50	63.30	24.4	2,647	665	23

15777	Barney Barron	do	German	Oct. 23	14.35	10.20	9.65	71.70			685	24
15780	Dr. Daniels	do	French	Oct. 27	18.17	13.25	12.59	72.90	17.4	2,881	250	9
	Average				16.17	11.62	11.04	71.90	19.9	3,139	655	23
15811	Alex. Eugh	Lawrence		Oct. 24	15.28	11.08	10.53	72.50			410	15
16021	Earl E. Boyce	Lincoln	Kleinwanzlebener	Oct. 30	17.49	13.95	13.26	79.70			320	11
16221	W. T. Pierce	McCook	do	Nov. 6	16.08	10.00	9.50	61.90			450	16
16099	G. B. Reid	McPherson	do	Nov. 2	19.31	14.80	14.07	76.70			515	18
15869	Rev. Ira D. Clark	do		Oct. 26	18.57	13.00	12.35	70.00	17.4	2,716	680	24
16099	Geo. B. Reid	do	Kleinwanzlebener	Nov. 2	18.31	14.75	14.01	80.60	12.6	2,568	285	10
16407	Geo. Roesler	do	German	Nov. 14	20.77	17.30	16.44	83.30	15.0	3,707	375	13
	Average				19.24	14.96	14.21	77.70	15.0	2,997	464	16
15678	J. S. Hanon	Marshall	French	Oct. 21	19.13	13.70	13.02	71.60	10.9	1,835	790	28
15871	E. M. Ireland	do	Bulteau Desprez	Oct. 26	21.17	14.25	13.53	67.40			530	19
	Average				20.15	13.97	13.27	69.30	10.9	1,835	660	23
16373	M. Bohlman	Miner	German	Nov. 13	17.19	12.45	11.83	72.40	15.6	2,410	502	18
15316	Valentine Seubert	Minnehaha	Vilmorin	Oct. 12	17.99	13.26	12.60	73.70	12.0	2,011	325	12
15459	Tollef Anundson	do	Kleinwanzlebener	Oct. 16	15.28	11.22	10.75	74.10			810	29
16288	Wm. Englehardt	do	French	Nov. 9	18.37	13.75	13.03	74.90	24.4	4,309	870	31
	Average				17.21	12.74	12.13	74.30	18.2	3,160	668	24
15864	James Wilson	Moody	Vilmorin	Oct. 26	18.37	14.55	13.83	79.20	20.4	4,033	590	21
15870	do	do	Kleinwanzlebener	Oct. 26	18.17	12.75	12.12	70.20	18.7	2,869	625	22
16219	do	do	do	Nov. 6	17.59	12.90	12.26	72.20	18.7	2,986	500	18
16220	do	do	Vilmorin	Nov. 6	19.09	14.60	13.87	76.50	20.7	3,964	310	11
	Average				18.30	13.70	13.02	74.50	19.6	3,462	506	18
15928	James Nailor, jr	Potter	White, globe	Oct. 27	18.64	12.55	11.93	67.30			225	8
15748	J. T. Stowell	Roberts	Kleinwanzlebener	Oct. 22	19.09	14.07	13.37	77.00			295	10
15971	Jno. C. Reeve	do	Bulteau Desprez	Oct. 29	15.53	11.00	10.45	70.80			825	29
16377	A. H. Green	do	do	Nov. 13	18.77	14.60	13.87	77.80			830	29
16378	O. Wright	do	Kleinwanzlebener	Nov. 13	20.87	15.05	14.30	74.30			643	23
	Average				18.56	13.68	12.99	75.00			650	23
16054	James Salisbury	Sanborn		Oct. 31	20.27	14.60	13.87	72.00			550	19
16432	Simon Degginger	do	Kleinwanzlebener	Nov. 6	21.73	16.30	15.49	75.00	13.9	2,915	665	23
	Average				21.00	15.45	14.68	73.50	13.9	2,915	607	21

Summary of results by States and counties—Continued.

SOUTH DAKOTA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in—Juice.	Sucrose in—Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15867	Julius Liebig	Spink	French	Oct. 26	22.78	17.70	16.82	77.70			420	15
15868	do	do	do	Oct. 26	21.17	16.55	15.72	78.20	17.0	3,772	417	15
16341	J. and C. B. Ward	do	Bulteau Desprez	Nov. 11	19.19	13.25	12.59	69.00			400	14
16342	do	do	do	Nov. 11	20.09	14.50	13.77	72.20			460	16
16458	M. Connor	do	Kleinwanzlebener	Nov. 16	15.85	10.50	9.98	66.20	6.1	727	605	21
	Average				19.81	14.50	13.78	72.60	11.55	2,250	460	16
15460	Frank Goddard	Sully	Kleinwanzlebener	Oct. 16	20.79	15.50	14.72	74.60			250	9
15775	Dr. S. B. Tenny	Turner	Desprez	Oct. 23	14.55	12.00	11.40	82.50	17.4	2,954	440	16
15181	O. R. Spencer	Union	French	Oct. 6	11.65	7.65	7.26	66.00			1,520	54
16147	do	do	do	Nov. 3	15.98	11.10	10.55	69.60			1,125	40
	Average				13.81	9.37	8.90	67.80			1,342	47
15146	Jacob Thayer	Walworth		Oct. 2	12.58	8.37	7.95	66.60			250	9
15456	N. P. Sunderland	do	French	Oct. 16	18.29	13.85	13.08	75.70	12.0	2,156	235	8
15461	Wm. H. Sunderland	do	Kleinwanzlebener	Oct. 16	18.89	14.37	13.65	76.10	8.7	1,471	180	6
15498	F. A. Shaw	do	French	Oct. 17	16.18	11.81	11.22	73.00			548	19
	Average				16.48	12.10	11.49	71.60	10.35	1,813	303	11
15970	James Connell	Yankton	French	Oct. 29	18.03	13.65	12.92	75.70			830	29
	Average of State				17.41	13.11	12.45	75.30	16.74	2,958	613	22

TENNESSEE.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in—Juice.	Sucrose in—Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets (Grams).	Average weight of beets (Ounces).
15322	E. Finger	Blount	Vilmorin Improved	Oct. 12	15.58	9.68	9.20	62.10			140	5
15323	do	do	Kleinwanzlebener	Oct. 12	11.78	6.00	5.70	50.90			710	25
	Average				13.68	7.84	7.45	56.50			425	15
15472	H. M. Collins	Bradley	French	Oct. 16	12.38	7.89	7.50	63.70			740	26

15473	......do	......do	German	Oct. 16	11.28	6.95	6.60	61.6	....	....	870	31
	Average				11.83	7.42	7.05	62.7	....	....	805	28
16597	Geo. Harris	Davidson	Kleinwanzlebener	Nov. 29	19.09	15.60	14.82	81.7	6.5	1,306	300	11
	Average of State				14.02	9.23	8.77	65.8	6.5	1,306	552	20

TEXAS.

15006	P. Pierson	Bosque	Kleinwanzlebener	Aug. 25	15.59	8.60	8.17	55.2	....	....	895	32
15007	......do	......do	......do	Aug. 25	13.89	8.22	7.81	59.2	....	....	1,110	39
	Average				14.78	8.41	7.99	57.2	....	....	1,002	35
15139	Jno. Burkhardt	Fayette	Kleinwanzlebener	Oct. 2	15.08	12.29	11.67	81.5	12.5	2,145	220	8
15140	......do	......do	Vilmorin Improved	Oct. 2	14.18	10.28	9.77	72.5	16.3	2,083	385	14
	Average				14.63	11.29	10.22	77.0	14.4	2,114	302	11
15135	J. A. Taylor	Hill		Oct. 2	17.19	12.30	11.69	71.5	12.4	1,870	230	8
15033	I. W. Hollingsworth	Johnson	Kleinwanzlebener	Sept. 15	14.07	9.01	8.56	64.0	8.93	865	970	34
16128	H. Stucke	Mason	French	Nov. 2	19.01	14.65	13.92	77.1	....	....	154	5
15041	W. B. Moss	Reeves	Red Top	Sept. 16	15.42	10.76	10.22	69.8	....	....	920	33
15000	R. Windsor	Runnels	Kleinwanzlebener	July 18	16.10	11.30	10.74	70.2	....	....	950	34
15001	......do	......do	Vilmorin Improved	July 18	15.20	11.10	10.54	73.0	....	....	830	29
	Average				15.65	11.20	10.64	71.6	....	....	890	31
	Average of State				15.57	10.85	10.31	69.1	12.91	1,663	662	23

VIRGINIA.

15056	O. K. Lapham & Co	Augusta	Bulteau Desprez	Sept. 21	14.90	12.14	11.53	80.8	....	....	670	24
15057	......do	......do	Lane's Imperial	Sept. 21	11.35	8.21	7.80	72.3	....	....	860	30
15058	......do	......do	Vilmorin Improved	Sept. 21	14.55	11.18	10.62	76.2	....	....	660	24
15327	......do	......do	Lane's Imperial	Oct. 12	13.68	9.74	9.24	71.2	....	....	590	21
15328	......do	......do	Vilmorin	Oct 12	16.39	12.37	11.75	75.5	....	....	420	15
15329	......do	......do	Diamond	Oct. 12	15.08	12.40	11.78	82.2	....	....	410	15
15330	......do	......do	Bulteau Desprez	Oct. 12	14.48	10.91	10.37	75.4	....	....	540	19
15899	H. G. Lapham	......do	Vilmorin	Oct. 26	17.27	13.25	12.59	76.7	....	....	510	18
15900	......do	......do	Lane's Imperial	Oct. 26	14.77	11.30	10.73	76.5	....	....	780	28

Summary of results by States and counties—Continued.

VIRGINIA—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15901	H. G. Lapham	Augusta	Bulteau Desprez	Oct. 26	15.35	10.70	10.17	69.7			510	18
16556	O. K. Lapham	do	do	Nov. 23	21.93	17.20	16.34	78.4			73	3
16618	do	do	Diamond	Dec. 7	17.04	12.40	11.78	72.5			270	10
16619	do	do	Vilmorin Improved	Dec. 7	16.24	13.40	12.74	82.5			420	15
16620	do	do	Bulteau Desprez	Dec. 7	14.72	17.80	11.21	80.1			550	19
16621	do	do	Lane's Imperial	Dec. 7	13.72	10.15	9.65	73.9			420	15
15155	E. W. Crosby	do	Vilmorin Improved	Oct. 3	14.67	10.80	10.26	73.6			760	27
15156	do	do	Diamond	Oct. 3	14.37	10.82	10.27	75.3			195	7
15157	do	do	Bulteau Desprez	Oct. 3	13.17	9.78	9.29	74.4			610	22
15158	do	do	Lane's Imperial	Oct. 3	12.87	9.47	8.99	72.6			830	29
15400	John Pennybaker	do	Vilmorin	Oct. 15	14.55	11.07	9.66	75.8			600	21
15401	do	do	Lane's Imperial	Oct. 15	12.75	9.57	9.10	75.4			630	22
15402	do	do	Bulteau Desprez	Oct. 15	15.77	13.31	12.65	84.2			620	22
15403	do	do	Diamond	Oct. 15	15.67	12.57	11.93	80.0			270	10
15602	Wm. C. Mitchell	do	Vilmorin	Oct. 19	16.37	12.75	12.11	77.9			370	13
15603	do	do	Bulteau Desprez	Oct. 19	15.35	11.40	10.83	74.3			195	7
16209	Chas. Lightheart	do	Vilmorin Improved	Nov. 5	15.33	11.90	11.31	77.6			510	18
16210	do	do	Diamond	Nov. 5	16.93	12.05	11.46	71.2			230	8
16211	do	do	Bulteau Desprez	Nov. 5	17.37	13.50	12.83	77.7			560	20
16212	do	do	Lane's Imperial	Nov. 5	14.33	9.65	9.17	67.3			610	22
16237	T. O. Greiner	do	Bulteau Desprez	Nov. 6	19.89	15.20	14.45	76.4			100	4
16368	F. C. V. Brown	do	do	Nov. 13	13.07	9.20	8.74	70.4			665	32
16369	do	do	Vilmorin Improved	Nov. 13	17.49	13.50	12.83	77.2			535	19
16370	do	do	Lane's Imperial	Nov. 13	15.67	11.30	10.74	72.1			535	19
	Average				15.37	11.85	11.06	75.7			500	18
15011	J. B. McLaughlin	Fauquier	Kleinwanzlebener	Sept. 3	13.32	10.10	9.59	75.8			790	28
15012	do	do	Vilmorin Improved	Sept. 3	13.22	10.16	9.65	76.9			505	18
15026	Jno. L. Roulstone	do	Vilmorin Improved	Sept. 14	12.39	9.38	8.91	75.7	13.07	1,592	460	16
15027	do	do	Kleinwanzlebener	Sept. 16	10.19	8.49	8.06	83.3	16.55	2,006	490	17
15036	Mrs. S. M. Johns	do	Vilmorin	Sept. 16	9.82	6.16	5.85	62.7	20.0	1,320	560	20
15037	do	do	Kleinwanzlebener	Sept. 16	11.22	7.39	7.02	65.8	19.6	1,635	740	26
15038	Mrs. Lucy F. Embery	do	Vilmorin	Sept. 16	11.02	8.32	7.90	75.5	20.9	2,249	730	26
15039	do	do	Kleinwanzlebener	Sept. 16	12.42	9.80	9.31	78.9	20.9	2,771	730	26
	Average				11.70	8.73	8.29	74.3	18.50	1,929	626	22
15009	Winchester Sugar Company	Frederick		Aug. 31	17.47	11.63	11.05	66.5			840	30
15053	do	do	German	Sept. 19	14.21	10.50	9.97	73.7			1,750	62

15054	do	do	do	Sept. 19	13.71	9.81	9.32	71.6			1,690	60
15055	do	do	do	Sept. 19	14.40	10.47	9.95	72.7			710	25
15098	do	do	do	Sept. 25	12.41	9.09	8.64	73.2			790	28
15245	do	do	do	Oct. 9	18.73	14.59	13.85	78.0			700	25
15292	do	do	French	Oct. 10	15.18	11.86	11.27	75.0			890	31
15293	do	do	German	Oct. 10	16.19	12.56	11.93	77.5			710	25
15368	do	do	do	Oct. 13	13.42	10.48	9.96	78.2			390	14
15369	do	do	do	Oct. 13	12.92	10.03	9.62	77.7			1,080	38
15379	do	do	Kleinwanzlebener	Oct. 14	18.37	14.19	13.48	77.2			540	19
15599	do	do	German	Oct. 19	19.27	15.55	14.77	80.7			1,150	41
15600	do	do	do	Oct. 19	18.47	15.55	14.77	84.2			565	20
15601	do	do	do	Oct. 19	19.57	16.20	15.39	82.8			480	17
15604	do	do	do	Oct. 19	14.35	9.75	9.26	68.0			450	16
15650	do	do	do	Oct. 20	13.28	9.70	9.22	73.0			1,240	44
15680	do	do	do	Oct. 21	15.51	12.25	11.64	79.0			357	13
15681	do	do	do	Oct. 21	14.61	11.20	10.64	76.7			283	10
15682	do	do	do	Oct. 21	14.21	11.00	10.45	77.4			357	13
15683	do	do	do	Oct. 21	13.71	10.60	10.07	77.4			1,240	44
15684	do	do	do	Oct. 21	18.03	14.45	13.73	80.0			433	15
15785	do	do	do	Oct. 23	17.57	13.50	12.83	76.8			510	18
15786	do	do	do	Oct. 23	18.37	14.65	13.92	74.3			537	19
15787	do	do	do	Oct. 23	18.47	14.60	13.87	79.1			483	17
15788	do	do	do	Oct. 23	19.57	15.85	15.06	77.0			447	16
15935	do	do	do	Oct. 27	14.92	11.15	10.59	74.9	20.7	2,964	790	28
15936	do	do	do	Oct. 27	18.74	15.45	14.68	82.4	20.9	4,565	430	15
15937	do	do	do	Oct. 27	16.24	12.70	12.07	78.2	21.0	3,576	320	11
15938	do	do	do	Oct. 27	18.44	14.80	14.07	80.3	22.4	4,565	500	18
	Average				16.22	12.56	11.93	76.7	21.3	3,918	712	25
16636	Chas. G. Eddy	Roanoke		Dec. 7	14.72	10.50	9.97	71.3			660	23
16617	Geo. A. Copp	Shenandoah	Vilmorin Improved	Dec. 7	17.24	14.05	13.34	81.7	16.3	3,208	350	12
	Average of State				15.32	11.80	11.12	76.0	19.3	2,768	600	21

WASHINGTON.

15263	J. E. Ferris	Lewis	Kleinwanzlebener	Oct. 10	15.98	9.68	9.20	74.4			860	30
15264	do	do	do	Oct. 10	17.08	12.30	11.68	72.3	9.8	1,493	455	16
15265	do	do	Lane's Imperial	Oct. 10	18.19	15.39	14.62	84.5			570	20
	Average				17.08	12.46	11.83	77.1	9.8	1,493	628	20
16484	George Menzel	Snohomish	French	Nov. 18	17.47	15.10	14.35	86.4			565	30
15078	J. F. Wood	Spokane	Vilmorin Improved	Sept. 23	19.13	16.18	15.37	84.5	6.53	1,529	840	

Summary of results by States and counties—Continued.

WASHINGTON—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16539	Henry Schutze	Stevens	Kleinwanzlebener	Nov. 21	20.11	17.25	16.39	85.8			380	13
16540	do	do	French	Nov. 21	20.93	19.60	18.62	95.2			190	7
	Average				20.52	18.43	17.51	90.5			285	10
16306	A. N. Thornton	Whatcom	Vilmorin Improved	Nov. 9	18.47	16.25	15.44	88.0			525	19
16307	do	do	Kleinwanzlebener	Nov. 9	18.57	16.80	15.96	90.5			455	16
	Average				18.52	16.53	15.70	89.3			490	18
15694	Frank Ryder	Whitman	German	Oct. 21	19.23	15.75	14.96	81.9			345	12
15695	do	do	French	Oct. 21	16.63	13.25	12.59	79.7			575	20
	Average				17.93	14.50	13.78	80.8			460	16
	Average of State				18.34	15.23	14.47	83.9	8.17	1,511	524	18

WISCONSIN.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. (Grams)	Average weight of beets. (Ounces)
15205	R. R. Roberts	Adams		Oct. 8	17.09	13.15	12.51	77.3			290	10
15206	do	do		Oct. 8	16.29	12.59	11.96	77.3			440	16
15387	C. R. Lukle	do	German	Oct. 15	18.15	10.83	10.28	59.7			957	34
15439	O. Olson	do	Kleinwanzlebener	Oct. 16	14.68	11.34	10.77	77.3			483	17
16375	Hugh Barnes	do	White	Nov. 13	16.27	13.00	12.35	79.9	18.3	3,261	790	28
	Average				16.50	12.18	11.57	74.3	18.3	3,261	592	21
15385	M. H. W. Whitcomb	Barron		Oct. 15	18.17	14.65	13.91	80.7	10.9	2,210	77	3
15659	A. Gulickson	do	Vilmorin	Oct. 21	19.63	14.70	13.97	74.9			385	14
15759	M. A. Gates	do		Oct. 23	14.75	10.75	10.22	73.0			727	26
16039	Gilbert O. Wall	do		Oct. 31	17.77	14.20	13.49	80.0	24.6	4,795	580	20
	Average				17.58	13.58	12.90	77.2	17.75	3,503	442	16
15234	A. Kramer	Brown		Oct. 9	11.03	7.74	7.54	72.1			2,260	80
15258	do	do		Oct. 10	11.28	9.44	8.97	83.5			1,000	35

15342	Wendel Thelen	do		Oct.	13	16.31	13.74	13.05	84.3			390	14
15397	Jacob Hein	do	German	Oct.	15	12.85	9.02	8.57	76.4			1,043	37
15621	F. Zimmerman	do	Kleinwanzlebener	Oct.	20	13.48	9.20	8.74	68.3			1,213	43
15334	J. E. Duaime	do	do	Oct.	13	13.22	8.80	8.36	66.6			680	24
15262	Rasmus Petersen	do		Oct.	10	17.79	13.85	13.15	77.0			553	20
	Average					13.71	10.26	9.77	75.5			1,020	36
15394	Jacob Angst	Buffalo		Oct.	15	12.74	8.15	7.94	64.2			483	17
15529	John B. Myer	do	Kleinwanzlebener	Oct.	19	17.77	14.03	13.58	80.5	20.3	3,967	363	13
15530	do	do	Vilmorin	Oct.	19	16.37	12.09	12.25	78.8	20.3	3,538	427	15
15751	George Hess	do		Oct.	23	15.55	11.00	10.45	70.8			890	31
16181	Alfred Day	do	German	Nov.	5	19.37	16.50	15.68	85.2			210	7
	Average					16.36	12.35	11.98	75.9	20.3	3,753	475	17
16216	Aug. A. Paulsen	Calumet	Kleinwanzlebener	Nov.	6	18.59	15.80	15.02	84.9	10.0	2,301	280	10
16238	Gottfried Abitz	do		Nov.	6	11.18	7.65	7.27	68.3			445	16
	Average					14.89	11.73	11.15	76.6	10.0	2,301	363	13
15431	J. W. Thomas	Chippewa		Oct.	16	14.58	10.85	10.31	74.4			765	27
15613	Joseph Ruff	do	Kleinwanzlebener	Oct.	20	14.08	10.70	10.16	76.0	12.2	1,701	910	32
15708	Phillip Rheingans	do		Oct.	22	13.48	10.30	9.79	76.4			1,135	40
15713	M. Sarrasin	do		Oct.	22	12.38	9.15	8.69	73.8			1,253	44
15847	Anton Bischel	do	White	Oct.	26	13.75	9.80	9.32	71.3			1,230	43
15848	S. B. Peterson	do	do	Oct.	26	13.55	9.35	8.89	69.0			1,077	38
	Average					13.64	10.03	9.53	73.5	12.2	1,701	1,062	37
15153	Lillie Vaughan	Clark		Oct.	3	18.53	15.09	14.33	81.4			425	15
15173	do	do		Oct.	5	19.01	15.65	14.87	82.4			340	12
15171	E. T. Nixdorf	do	Kleinwanzlebener	Oct.	5	16.18	11.86	11.27	73.3			295	11
15170	do	do	do	Oct.	5	15.38	10.22	9.71	66.4			370	13
15207	do	do	do	Oct.	8	17.19	12.88	12.22	74.9			370	13
15208	do	do	do	Oct.	8	18.59	15.42	14.65	83.1			360	13
15254	James Graham	do	do	Oct.	10	13.58	9.49	9.01	69.7	16.4	1,860	410	14
15388	C. G. Garsegner	do		Oct.	15	15.35	11.29	9.79	73.6			613	22
15623	L. Randall	do	Kleinwanzlebener	Oct.	20	15.48	10.85	10.26	70.1	13.6	1,773	620	22
15705	Friedrich W. Kalepp	do		Oct.	22	16.19	13.85	13.16	85.6			603	21
16420	August Erler	do	French	Nov.	16	16.53	11.85	11.26	71.1			645	23
16426	do	do	do	Nov.	16	15.13	11.50	10.93	76.0			690	24
15547	Fred. Müller	do		Oct.	19	15.75	11.95	11.35	75.9			717	25
15391	Matt. N. Wells	do	Kleinwanzlebener	Oct.	15	14.65	11.05	10.50	75.7			633	22
	Average					16.25	12.35	11.67	75.7	15.0	1,817	507	18
15200	John Mishler	Columbia	Kleinwanzlebener	Oct.	8	13.99	9.31	9.00	66.5	19.8	2,063	620	22
15201	do	do		Oct.	8	13.19	8.15	7.65	61.7			530	19
15298	I. L. Curtis	do		Oct.	12	16.08	11.81	11.22	73.3			640	23
15521	R. Hopkins	do		Oct.	19	16.55	11.50	10.97	69.5			987	35
15802	J. H. Randall	do		Oct.	24	14.35	10.05	9.55	73.1			1,275	45

Summary of results by States and counties—Continued.

WISCONSIN—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16145	D. Lasky	Columbia	Kleinwanzlebener	Nov. 3	18.87	15.05	14.30	85.1	20.9	4,590	675	24
16502	Thomas Anderson	do		Nov. 19	16.50	11.30	10.74	68.3			333	12
15915	Chas. M. Johnson	do	Kleinwanzlebener	Oct. 27	18.24	13.65	12.98	74.8			495	17
	Average				15.97	11.35	10.80	71.5	20.4	3,327	694	25
15493	George J. Schoeffer	Crawford	Kleinwanzlebener	Oct. 17	17.09	13.69	13.01	86.0	13.1	2,644	860	30
15515	Albert Swatek	do		Oct. 19	12.44	7.20	6.84	57.9			3,266	115
15549	H. C. Wachter	do		Oct. 19	12.35	9.00	8.55	72.9			1,867	66
15631	C. C. Pickett	do		Oct. 20	12.28	7.60	7.22	61.9			1,433	51
	Average				13.54	9.37	8.91	69.7	13.1	2,644	1,857	66
15270	E. A. Wright	Dane	German	Oct. 10	16.08	11.81	11.22	73.3			1,010	36
15374	E. Evans	do		Oct. 14	15.15	10.89	10.34	72.1			335	12
15539	J. C. Cannon	do		Oct. 19	14.35	10.85	10.31	75.7			613	22
15845	J. R. Henderson	do	Kleinwanzlebener	Oct. 26	17.37	12.20	12.09	73.1			597	21
16037	R. Williamson	do	German	Oct. 31	20.67	16.55	15.72	80.0			520	18
16214	W. J. Radke	do		Nov. 6	16.28	12.40	11.78	76.2			670	24
16239	W. H. Pauli	do	Kleinwanzlebener	Nov. 7	23.77	19.00	18.05	80.0			415	15
15702	L. A. Halverson	do	German	Oct. 22	16.18	12.25	11.64	79.7			260	9
	Average				17.48	13.24	12.64	76.3			553	21
15255	William Kube	Dodge	Vilmorin Improved	Oct. 10	18.59	14.03	13.43	75.4			300	11
15260	do	do		Oct. 10	12.48	8.71	8.27	69.6			640	23
15479	James Woodrow	do	Kleinwanzlebener	Oct. 16	13.38	8.89	8.45	66.4			1,970	70
15482	J. C. Lieske	do		Oct. 17	17.09	14.22	13.51	83.2			330	12
15489	Ludwig Somerfeld	do		Oct. 17	14.08	7.03	6.68	49.9			627	22
15624	A. C. Becker	do		Oct. 20	15.68	12.20	11.60	77.8			757	27
15789	Emil G. Breselow	do	German	Oct. 23	16.37	13.30	12.64	81.3			1,143	40
15966	Theo. Wedemeyer	do		Oct. 29	18.03	14.65	13.92	81.2			417	15
16034	Frank Holz	do	German	Oct. 31	12.75	8.10	7.70	63.5			1,825	64
15432	O. R. Jones	do	Kleinwanzlebener	Oct. 16	12.58	9.53	9.05	75.8			533	19
15437	George Reklan	do		Oct. 16	14.08	10.34	9.82	73.4			1,013	36
15668	Charles Discher	do		Oct. 21	14.41	10.65	10.12	73.2			1,707	60
16544	C. C. Deitz & Sons	do	German	Nov. 23	18.77	15.42	14.65	82.1			780	28
15794	Jno. Bachuber	do	French	Oct. 24	17.17	13.25	12.59	77.2			945	33

15804	Alfred O. Puls	do		Oct. 24	13.75	10.80	10.26	78.60			1,150	40
	Average				15.28	11.41	10.85	73.90			942	33
15552	Anton J. Eichinger	Door		Oct. 19	16.17	13.85	13.16	85.70	14.3	2,912	333	12
15945	L. R. Stephenson	do	Imperial	Oct. 28	15.14	12.40	11.78	81.80			970	34
16530	Elmer Birmingham	do		Nov. 20	18.17	14.55	13.82	80.00			1,025	36
16654	Jas. McArdle	do	Kleinwanzlebener	Dec. 21	18.27	14.54	13.81	79.50			1,075	38
16655	do	do	Vilmorin	Dec. 21	17.54	13.18	12.52	75.30			1,050	37
	Average				17.06	13.70	13.02	80.50	14.3	2,912	891	27
15301	Thomas Darling	Dunn		Oct. 12	14.88	10.24	9.73	69.40			1,235	44
15495	S. Rudesill	do		Oct. 17	15.08	10.78	10.25	71.50	9.9	1,307	797	28
15664	John W. Atkinson	do	White	Oct. 21	14.61	11.20	10.64	76.70			597	21
15750	William Miller	do		Oct. 23	15.67	9.60	9.12	61.20			1,240	44
15801	William Moedy	do		Oct. 24	16.17	13.25	12.59	81.90			787	28
16081	R. Cunningham	do	White	Nov. 2	13.29	9.85	9.34	74.10			680	24
16374	M. McDonald	do	do	Nov. 13	18.85	12.20	11.59	65.30			1,233	44
16531	William Suser	do	Kleinwanzlebener	Nov. 20	16.65	12.80	12.16	76.90			1,225	43
15433	Jno. Reinecke	do		Oct. 16	14.08	10.66	10.13	75.70			1,373	48
	Average				15.48	11.18	10.62	72.50	9.9	1,307	1,019	35
15336	Carl Bernicke	Eau Claire		Oct. 13	14.42	11.18	9.68	77.60			950	34
15337	Robt. Schilling	do		Oct. 13	14.62	13.93	13.23	85.00			890	31
15338	Fred. Mueller	do		Oct. 13	15.02	11.97	11.37	79.80			570	20
15393	Jno. Nix	do		Oct. 15	15.15	10.08	7.68	66.30			313	11
15446	D. W. Sherman	do	White	Oct. 16	16.19	12.51	11.89	77.30			995	35
15519	R. J. Kepler	do		Oct. 19	13.85	10.55	10.02	76.20			800	28
15630	A. J. Cheesbro	do		Oct. 20	15.28	12.00	11.40	78.50			807	28
15700	G. W. Leufkin	do		Oct. 22	14.28	11.00	10.45	77.00			740	26
	Average				14.85	11.65	10.72	77.20			758	27
15230	Joseph Zeller	Fond du Lac		Oct. 9	14.63	11.34	10.77	77.70			910	32
15231	do	do		Oct. 9	15.03	11.03	9.53	73.63			1,000	35
15618	G. Stelton	do	German	Oct. 20	12.88	9.50	9.01	74.50			1,103	39
15790	Peter Korb	do		Oct. 23	12.45	8.50	8.08	68.30			2,013	71
15912	Henry L. Clapp	do		Oct. 27	16.20	11.35	10.79	70.00			530	19
16036	P. C. Jacobs	do		Oct. 31	17.97	14.25	13.54	83.50			790	28
	Average				14.86	11.00	10.29	74.60			1,058	37
15527	Jno. Masbaum	Forest		Oct. 19	14.45	9.80	9.31	67.80			727	26
15228	Anton Longmire	Grant		Oct. 9	17.03	12.77	12.13	74.10			520	18
15269	do	do		Oct. 10	15.79	12.61	11.98	80.00			450	16
15373	Jacob Baumgartner	do		Oct. 14	13.85	9.20	8.74	66.60			1,130	40
15536	Robt. H. Davidson	do		Oct. 19	13.45	9.60	9.12	71.40			1,167	41

Summary of results by States and counties—Continued.

WISCONSIN—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15807	Jno. Harris	Grant		Oct. 24	13.25	8.80	8.36	66.40			1,020	36
16032	N. E. France	do	French	Oct. 31	19.65	12.80	12.16	65.10			790	28
16033	do	do	German	Oct. 31	17.25	10.55	10.02	61.20	23.0	2,427	800	28
	Average				15.75	10.90	10.36	69.30	23.0	2,427	840	30
15198	Thomas Munger	Green	Kleinwanzlebener	Oct. 8	19.31	14.29	13.58	74.00			655	23
15199	do	do	French	Oct. 8	17.81	15.82	15.03	88.80			540	19
15184	Henry Osborn	do		Oct. 6	16.15	12.35	11.73	76.50			430	15
15209	do	do		Oct. 8	15.28	11.61	11.02	76.00			480	17
15212	Albert Daniels	do	Kleinwanzlebener	Oct. 8	17.68	12.89	12.29	72.90	8.7	1,437	435	15
15669	Jno. Elmer	do		Oct. 21	16.63	12.50	11.88	75.20			440	16
16035	C. J. Johnson	do		Oct. 31	21.17	15.90	15.11	75.10			870	31
16185	Thomas Sears	do		Nov. 5	14.53	11.35	10.78	78.00	18.9	2,869	670	24
	Average				17.32	13.34	12.68	77.10	13.8	2,153	565	20
15620	H. G. Bahr	Green Lake		Oct. 20	14.38	11.50	10.93	80.00			1,130	40
15396	D. L. Rogers	Iowa	White	Oct. 15	13.15	9.45	8.98	73.80			1,343	47
16537	Thomas Convey	do	Imperial	Nov. 21	16.79	12.80	12.16	75.50	20.7	3,428	990	35
16358	Frank Williams	do	Kleinwanzlebener	Nov. 11	18.29	12.60	11.97	68.90			903	32
15389	Martin Treseder	do	German	Oct. 15	14.55	10.93	10.38	75.10			907	32
	Average				15.70	11.45	10.87	73.30	20.7	3,428	1,036	37
15202	J. C. Loomis	Jackson		Oct. 8	14.78	11.32	10.75	76.60			980	35
15203	do	do	French	Oct. 8	13.38	10.52	10.00	78.60			1,310	46
15516	H. Overby	do		Oct. 19	12.65	7.30	6.94	57.70			1,600	57
	Average				13.60	9.71	9.23	71.00			1,297	46
15092	Julius Schoechert	Jefferson	French	Sept. 25	20.43	14.90	14.15	72.90	19.36	3,605	420	15
15093	do	do	Kleinwanzlebener	Sept. 25	21.93	16.96	16.11	77.30	19.36	4,252	356	13
15094	Ferdinand Hartwig	do	French	Sept. 25	20.13	16.38	15.56	81.30	8.96	2,045	510	18
15159	Otto Bartz	do		Oct. 3	16.59	12.88	12.24	78.50			865	31
15224	Chas. Jaquith	do	Kleinwanzlebener	Oct. 9	17.33	14.14	13.69	81.60	5.5	1,080	290	10
15235	Jno. Brockmann	do		Oct. 9	15.23	10.07	11.46	79.20			785	28
15236	do	do		Oct. 9	17.03	12.93	12.28	76.00			850	30

15395	Jos. Raffarty	do	German	Oct. 15	18.67	14.51	13.78	77.60			470	17
15443	Phineas Jaquith	do	do	Oct. 16	12.78	8.98	8.53	72.00			1,160	41
15628	L. M. Krippner	do	do	Oct. 20	17.08	12.00	11.40	70.30			917	32
15752	G. Marquart	do	do	Oct. 23	19.67	15.40	14.63	78.30			750	26
15793	Timothy Loeffler	do	Kleinwanzlebener	Oct. 24	19.36	15.80	15.01	81.50			980	35
15846	August Krueger	do	German	Oct. 26	16.67	12.90	12.23	77.40	11.2	1,917	440	16
15963	David Hildemann	do	do	Oct. 29	16.73	13.65	12.98	81.60			567	20
16070	Henry Trachte	do		Nov. 2	18.31	14.70	13.97	80.30			970	34
16074	Theo. Haney	do		Nov. 2	15.79	12.50	11.88	79.20			990	35
16082	Wm. Piper	do	Kleinwanzlebener	Nov. 2	16.29	12.40	11.78	76.10			450	16
16083	A. A. Craig	do	Vilmorin	Nov. 2	18.31	14.10	13.40	77.00	15.7	2,920	420	15
16084	Aug. Pischaelfer	do	Kleinwanzlebener	Nov. 2	18.31	14.15	13.44	77.30	19.3	3,618	590	21
	Average				17.72	13.65	13.08	77.60	14.20	2,777	673	24
15306	Chas. Grant	Juneau		Oct. 12	16.88	11.00	10.49	68.00	8.0	1,026	520	18
15533	Daniel Fowler	do	French	Oct. 19	18.97	14.75	14.01	77.80	18.6	3,660	250	9
15545	A. M. Smith	do		Oct. 19	13.75	10.50	9.98	76.40			933	33
15749	Chas. A. Pazik	do		Oct. 23	17.37	13.75	13.06	87.10			740	26
15969	James Mutch	do	Kleinwanzlebener	Oct. 29	16.43	12.50	11.88	76.10			960	34
16065	F. Prevey	do	Vilmorin Improved	Nov. 2	18.41	13.35	12.68	72.50			830	29
16263	E. Cook	do		Nov. 9	16.37	12.55	11.92	76.70			950	34
15487	N. W. Hess	do	Kleinwanzlebener	Oct. 17	14.58	10.43	9.91	71.50	18.5	2,364	1,217	43
	Average				16.60	12.35	11.74	75.80	15.0	2,350	800	28
15372	G. H. Kröncke	Kenosha	Kleinwanzlebener	Oct. 14	10.34	6.86	6.52	66.60			1,600	57
15223	Jacob Roth	Kewaunee		Oct. 9	18.63	14.67	13.93	78.70	5.5	1,089	210	7
15806	Chas. Serrahn	do	French	Oct. 24	17.27	14.65	13.92	84.80			820	29
15852	William B. Ray	do	Kleinwanzlebener	Oct. 26	16.67	13.40	12.73	80.40	13.0	2,401	563	20
16069	Frank Wirth	do		Nov. 2	16.59	12.30	11.69	74.10			1,100	39
16275	J. W. Adams	do	French	Nov. 9	20.17	17.00	16.14	84.30			420	15
16276	Jno. Boamaster	do	German	Nov. 9	19.37	15.65	14.87	80.80			990	35
16534	Steve Kulhamek	do	do	Nov. 21	19.91	15.05	14.30	75.60			600	21
16535	John Wagner	do	do	Nov. 21	19.81	15.70	14.92	79.30			940	33
16536	Wm. Oestrich	do	do	Nov. 21	21.60	17.25	16.39	79.80			310	11
16533	John Albright	do			15.59	11.05	10.50	70.80			660	23
	Average				18.56	14.67	13.94	79.00	9.25	1,745	661	23
15340	W. F. Moeser	Lacrosse		Oct. 13	13.52	10.68	10.14	79.00			660	20
15670	Oscar F. Elwell	do		Oct. 23	14.55	11.00	10.45	75.60			633	22
15911	Jno. E. Lepke	do	Kleinwanzlebener	Oct. 27	15.42	12.25	11.64	79.40			840	30
15968	John Dawson	do		Oct. 29	16.73	13.20	12.54	78.90			870	31
16328	Frank Wuensch	do		Nov. 10	23.91	19.00	18.05	79.50			340	12
15430	Herman Bonsack	do	Imperial	Oct. 16	14.98	11.59	11.01	77.40			643	23
	Average				16.52	12.95	12.31	78.30			664	24
15304	Thomas Buxton	Lafayette		Oct. 12	14.18	11.36	10.79	80,00			770	27
15670	E. M. Curkeet	do		Oct. 21	16.33	12.80	12.16	78.90			867	31

Summary of results by States and counties—Continued.

WISCONSIN—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
					Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15672	R. D. Seely	Lafayette	White	Oct. 21	15.61	11.75	11.16	75.30			823	29
15698	R. T. Lillie	do		Oct. 22	15.28	11.80	11.21	77.20			847	30
15715	do	do		Oct. 22	15.68	11.85	11.26	75.50			713	25
	Average				15.42	11.91	11.32	77.40			804	28
15300	H. Brennecke	Langlade		Oct. 12	14.88	11.86	11.27	79.60			680	24
15762	Thomas Martin	Lincoln	German	Oct. 23	14.35	11.50	10.93	80.10	5.7	901	313	11
15371	Adam Bleser	Manitowoc		Oct. 14	12.34	6.80	6.46	55.30			800	28
15434	B. Doolan	do		Oct. 16	14.28	10.61	10.08	74.30			863	30
15485	Julius Thieleke	do		Oct. 17	12.58	8.58	8.15	68.20			1,420	50
15542	Max Boehm	do		Oct. 19	11.95	7.70	7.32	64.40	18.1	1,538	1,233	44
15546	Job. Reznicek	do		Oct. 19	14.65	10.70	10.17	75.00			377	18
15965	F. W. Rades	do		Oct. 29	17.73	13.85	13.16	78.10			300	11
16270	H. C. Koch	do	Kleinwanzlebener	Nov. 9	16.57	13.70	13.02	82.70			378	13
16566	Chas. Gurtandson	do	Desprez	Nov. 27	18.91	13.40	12.72	70.90			550	19
15714	Jno. Cochems	do		Oct. 22	14.48	11.10	10.55	74.00			623	22
	Average				14.83	10.72	10.18	71.43	18.1	1,538	727	26
15344	Frank Feckner	Marathon		Oct. 13	15.92	11.81	11.22	74.10			450	16
15445	Lewis Spindler	do	Kleinwanzlebener	Oct. 16	14.29	10.45	9.93	73.10			680	24
15525	Chris. Weizenicker	do		Oct. 19	14.45	11.20	10.64	77.50			490	17
15615	Robt. C. Hoffman	do		Oct. 20	13.18	9.70	9.21	73.60			1,160	41
15616	do	do	Vilmorin Improved	Oct. 20	16.39	13.10	12.42	79.90			1,000	35
15758	Theo. Wehrmann	do		Oct. 23	14.45	10.50	9.97	73.00			633	22
15761	Annie Priest	do	German	Oct. 23	16.67	13.55	12.87	81.30			500	18
15798	Thomas O'Connor	do		Oct. 24	15.35	11.35	10.78	73.90			763	27
16011	August Baumann	do		Oct. 30	16.59	13.40	12.74	80.70			460	16
16012	Jno. Fandre	do		Oct. 30	15.48	12.30	11.69	79.30			980	35
16041	August Baeseman	do		Oct. 31	15.37	11.10	10.55	72.30			640	23
16144	Fred. Baumann	do		Nov. 3	18.67	14.88	14.11	79.50			330	12
16146	Fred. Bahr	do	Kleinwanzlebener	Nov. 3	16.17	12.70	12.07	78.50			770	27
	Average				15.61	12.00	11.40	76.70			681	24
15172	Z. G. Taylor	Marquette		Oct. 5	16.61	12.86	12.24	77.40			365	13

15174	......do	......do		Oct. 5	16.08	10.20	9.69	65.00	....	....	600	21
15763	F. A. Nickel	......do	Kleinwanzlebener	Oct. 23	16.37	12.75	12.11	77.90	19.4	3,304	420	15
16480	......do	......do	Vilmorin Improved	Nov. 17	20.18	17.50	16.63	86.70	11.5	2,990	320	11
16010	Carl Walter	......do		Oct. 17	18.78	15.40	14.65	81.50	....	....	40	1
	Average				17.60	13.74	13.06	78 00	15.45	3,147	349	12
15305	H. L. Moore	Milwaukee		Oct. 12	16.98	11.97	11.37	70.40	19.8	2,859	430	15
15496	C. A. Voetz	Monroe		Oct. 17	15.59	12.91	12.27	82.30	....	....	730	26
15528	Wm. H. Schmitz	......do		Oct. 19	14.55	10.95	10.40	75.30	....	....	1,643	58
15662	August Boetther	......do	Yellow	Oct. 21	14.51	9.45	8.98	67.20	....	....	703	25
15717	Edwin G. Kinne	......do		Oct. 22	14.58	10.30	9.79	70.70	....	....	580	20
15718	R. Drowatzky	......do	Kleinwanzlebener	Oct. 22	14.58	10.95	10.40	75.10	17	2.449	850	30
15719	Andrew Scott	......do		Oct. 22	15.39	13.00	12.35	84.50	....	....	1,330	47
15795	Saml. C. Smith	......do	Vilmorin Improved	Oct. 24	15.97	13.25	12.59	82.80	....	....	800	28
15796	Aug. Schlaver, sr	......do	Kleinwanzlebener	Oct. 24	15.14	11.65	11.06	76.80	....	....	1,020	36
15858	Roswell Smith	......do	......do	Oct. 26	15.35	12.15	11.54	79.10	....	....	1,007	36
15910	L. D. Wyatt	......do		Oct. 27	15.20	10.80	10.26	70.90	....	....	780	28
15913	J. K. Davis	......do		Oct. 27	14.72	9.35	8.88	63.50	....	....	610	22
16007	A. G. Aylesworth	......do	Imperial	Oct. 30	15.59	13.25	12.59	84.80	....	....	630	22
16593	William Chard	......do		Nov. 29	18.17	16.75	15.92	92.10	....	....	560	20
16040	F. A. Meissner	......do		Oct. 30	17.37	14.45	13.73	82.60	....	....	390	14
15673	Ferd. Kemnow	......do	White	Oct. 21	17.43	14.60	13.87	83.80	....	....	773	27
	Average				15.61	12.25	11.64	78.10	17	2,449	827	29
	Wm. E. Volk	Oconto		Oct. 8	17.09	13.26	12.60	77.60	....	....	765	27
15225	......do	......do		Oct. 9	17.03	13.37	12.76	78.60	....	....	650	23
15297	J. S. Harvey	......do		Oct. 12	13.78	9.74	9.25	70.00	....	....	740	26
15429	Carl Birr	......do	German	Oct. 16	15.68	12.10	11.50	77.20	....	....	1,090	39
15535	James Bedore, sr	......do	White	Oct. 19	14.85	10.80	10.26	72.80	....	....	913	32
15550	James Bedore, jr	......do	......do	Oct. 19	14.97	12.70	12.06	84.90	....	....	1,053	37
15551	E. J. Martindale	......do		Oct. 19	15.57	12.75	12.11	81.90	....	....	870	31
15709	J. V. Herriman	......do	German	Oct. 22	16.69	14.65	13.92	87.70	....	....	530	19
15722	A. W. Boettoher	......do		Oct. 22	12.48	9.70	9.22	77.70	....	....	750	26
15792	Jno. A. Schweiberg	......do	Vilmorin	Oct. 24	17.77	15.00	14.25	84.30	23.9	5.181	675	24
16500	Joseph Woulier	......do	White	Nov. 19	17.23	12.65	12.02	69.80	....	....	1,307	46
15660	Albert Kirchner	......do		Oct. 21	10.91	7.30	6.94	66.90	....	....	1,550	55
	Average				15.34	12.00	11.41	77.50	23.9	5,181	908	32
15025	Jno. H. McGillan	Outagamie	German	Sept. 17	16.93	13.66	12.69	80.60	21.78	4,112	370	13
15046	......do	......do	French	Sept. 17	18.33	15.50	14.72	84.60	21.78	4,892	310	11
15259	W. D. Barnes	......do	Kleinwanzlebener	Oct. 10	15.28	10.44	9.92	68.10	....	....	480	17
15295	M. H. True	......do	......do	Oct. 12	13.78	10.44	9.92	75.70	9.80	1,327	680	24
15341	D. M. Torrey	......do		Oct. 13	14.02	10.06	9.66	71.90	....	....	690	24
15481	Ed. Gardner	......do		Oct. 17	15.28	11.16	10.60	73.00	....	....	1,310	46
15483	Jno. Schwartz	......do	French	Oct. 17	17.09	13.37	12.70	78.20	....	....	510	18
15484	......do	......do	German	Oct. 17	17.69	13.39	12.72	75.70	....	....	500	18
15486	Anton Becker	......do	Kleinwanzlebener	Oct. 17	15.69	12.37	11.75	78.80	....	....	1,740	66
15494	Jno. F. Hinz	......do		Oct. 17	12.58	9.59	9.11	76.20	....	....	513	18

Summary of results by States and counties—Continued.

WISCONSIN—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15523	K. Kreutzberg	Outagamie		Oct. 19	13.95	9.60	9.12	68.80			1,640	58
15704	Conrad Boehler	do		Oct. 22	14.58	11.11	10.55	76.10			603	21
15712	Geo. A. Phillipi	do	Kleinwanzlebener	Oct. 22	15.09	12.55	11.93	83.11	18.0	3,218	933	33
15756	Joshua Bull	do	do	Oct. 23	14.85	10.80	10.26	72.70			1,240	44
15844	C. Thiessanhusen	do	German	Oct. 26	17.37	12.70	12.09	73.10			597	21
15849	Joseph Peter	do	Kleinwanzlebener	Oct. 26	16.37	13.05	12.40	79.70	24.3	4,053	690	24
15850	do	do	Vilmorin	Oct. 26	16.07	12.50	11.88	77.80	24.3	4,053	690	24
15855	Geo. Breyer	do	Kleinwanzlebener	Oct. 26	15.85	11.70	11.16	73.80			557	20
15860	C. Thiessanhusen	do	French	Oct. 26	17.47	13.50	12.83	77.30			1,200	42
16129	Hans Wiechert	do		Nov. 2	17.01	13.25	12.59	77.60			780	28
16449	E. Nickei	do	German	Nov. 16	18.17	14.05	13.35	77.30			1,323	47
	Average				15.88	12.13	11.52	76.20	19.99	3,609	826	29
15308	Jno. G. Buch	Ozaukee	Vilmorin Improved	Oct. 12	20.39	15.37	14.60	75.40	19.2	3,802	250	9
15309	do	do	Kleinwanzlebener	Oct. 12	19.59	15.35	14.58	78.40	20.9	4,312	270	10
15667	Wm. Liesenberg	do	Vilmorin	Oct. 21	19.23	16.20	15.39	84.30	20.0	4,684	568	20
15857	Chas. Mueller	do	Kleinwanzlebener	Oct. 26	15.95	12.90	12.27	80.90	16.3	3,208	570	20
15252	Jos. Fleissner	do		Oct. 9	15.23	10.78	10.24	70.9			775	28
	Average				18.08	14.12	13.42	78.00	19.1	4,002	487	17
15339	Fred. Pittman	Pepin		Oct. 13	16.41	13.93	13.23	85.00			890	31
15526	Anton Faast	do	Kleinwenzlebener	Oct. 19	15.05	11.60	11.02	77.10	11.9	1,826	650	23
15851	A. Rohrscheib	do	do	Oct. 26	15.35	12.15	11.54	79.20	17.0	2,805	773	27
15853	do	do	Vilmorin	Oct. 26	17.97	15.10	14.35	84.00	16.1	3,494	503	18
16264	John Wirsinger	do	Kleinwanzlebener	Nov. 9	18.17	14.25	13.54	78.40			720	25
	Average				16.59	13.41	12.74	80.74	15.0	2,708	707	25
15233	G. F. Weisemann	Pierce		Oct. 9	16.03	11.81	11.22	73.80			575	20
15257	do	do		Oct. 10	15.68	11.29	10.72	72.00			570	20
	Average				15.86	11.55	10.97	72.90			573	20
15392	Joel A. Marble	Polk		Oct. 15	16.65	12.08	11.48	72.80			463	16
15398	James Wilson	Portage	White	Oct. 15	11.85	8.08	7.68	68.50			348	12
15617	A. P. Andrews	do	German	Oct. 20	14.18	10.50	9.98	73.30			470	17
15908	Wm. Giese	do	do	Oct. 27	13.60	10.70	10.17	78.70	15.3	2,209	1,010	36

15914	Geo. Tragesen	do		Oct. 27	14.92	11.15	10.59	74.80			380	13
16213	Gustavus Hoffman	do	Kleinwanzlebener	Nov. 6	13.28	8.35	8.03	62.90			1,730	61
16075	Edward Young	do		Nov. 2	18.01	14.10	13.40	76.40			380	13
	Average				14.31	10.48	9.98	72.43	15.3	2,209	720	25
15859	John Spaiker	Racine	Kleinwanzlebener	Oct. 26	16.77	13.35	12.68	79.60			533	19
15967	Adam Apple	do		Oct. 29	16.83	13.20	12.54	78.40			1,067	38
16501	W. J. Hausche	do		Nov. 19	19.50	15.50	14.73	79.40			533	19
	Average				17.70	14.02	13.32	79.13			711	25
15442	C. E. Jaquish	Richland	German	Oct. 16	14.28	10.28	9.77	72.00			1,160	41
15492	C. M. Porter	do		Oct. 17	16.09	12.29	11.68	76.40			1,027	36
15534	Gardner Walls	do	German	Oct. 19	15.07	12.70	12.09	84.30			520	18
15711	J. M. Clark	do	White	Oct. 22	14.08	11.55	10.98	81.90			877	31
16143	Edwin Roberts	do		Nov. 3	16.27	12.70	12.07	78.10	18.9	3,214	470	17
16187	W. T. Cass	do		Nov. 5	15.83	12.20	11.59	77.00			320	11
16543	Geo. A. Carswell	do	White	Nov. 23	15.91	12.00	11.40	75.5			700	25
	Average				15.36	11.96	11.37	77.89	18.9	3,214	725	26
15160	A. Austin	Rock		Oct. 3	13.97	10.12	9.61	72.30			2,810	99
15169	do	do		Oct. 5	13.08	9.17	8.71	70.10			2,030	72
15179	Edwin Hubbell	do		Oct. 6	12.25	8.05	7.66	65.70			750	26
15210	F. D. Reed	do		Oct. 8	15.68	10.51	9.99	67.00			390	14
15211	Edwin Hubbell	do	White	Oct. 8	15.08	11.75	11.16	78.30			620	22
15296	E. L. Bingham	do	German	Oct. 12	13.08	10.05	9.64	76.70			480	17
15491	John Tinker	do		Oct. 17	15.19	12.94	12.33	85.20			383	14
15522	Josiah Wadsworth	do	White	Oct. 19	16.65	11.40	10.83	68.50			700	25
15661	N. A. Austin	do	do	Oct. 21	16.23	14.40	13.68	88.70			660	23
15666	Aug. Schumann	do		Oct. 21	15.21	11.10	10.55	73.00			917	32
15797	David Walsh	do		Oct. 24	16.17	13.00	12.35	83.90	7.5	1,389	680	24
16009	W. H. Greenman	do		Oct. 30	17.09	13.00	12.35	76.00			1,140	40
16078	Jno. Kimball	do		Nov. 2	16.81	12.75	12.11	77.90			470	17
16215	Geo. B. Mackey	do	Imperial	Nov. 6	17.89	13.75	13.06	76.90			300	10
16265	C. J. Capman	do	German	Nov. 9	14.75	10.40	9.88	70.50			1,400	49
16532	E. D. Wheeler	do	French	Nov. 21	17.49	14.15	13.44	80.90			680	24
16448	Geo. W. Dawson	do	German	Nov. 16	16.37	13.00	12.35	79.40			466	17
	Average				15.47	11.74	11.16	75.90	7.5	1,389	875	31
15428	S. A. Raymond	St. Croix		Oct. 15	16.99	12.83	12.19	75.50	20.8	2,454	845	30
15537	G. F. Hanson	do		Oct. 19	14.85	10.70	10.17	72.10			520	18
15544	Clark Greenfield	do	German	Oct. 19	13.05	9.10	8.65	69.70			1,930	68
15909	George Martin	do		Oct. 27	13.20	8.40	7.97	63.50			1,390	49
16008	Robert Searle	do		Oct. 30	16.58	11.60	11.02	70.00			617	22
16477	Peter L. Larsen	do	Kleinwanzlebener	Nov. 17	23.08	17.60	16.52	76.30	13.1	3,189	420	15
15524	William Hennessy	do		Oct. 19	16.77	13.05	12.40	77.80			337	12
	Average				16.36	11.90	11.27	72.10	16.95	2,822	866	31

Summary of results by States and counties—Continued.

WISCONSIN—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15390	Adolf Krafft	Sauk		Oct. 15	15.75	10.59	10.05	67.20			457	16
15843	William H. Schutte	do	Kleinwanzlebener	Oct. 26	15.05	11.40	10.83	75.80			973	34
16184	H. J. Farnum	do	do	Nov. 5	18.67	14.08	13.37	79.30	22.9	4,610	750	26
	Average				16.49	12.02	11.42	74.10	22.9	4,610	727	25
15333	Albert Ayres	Sawyer		Oct. 13	14.02	10.49	9.96	74.90			1020	36
15185	William McCoy	Shawano	Vilmorin Improved	Oct. 6	18.77	14.56	13.82	77.50	22.4	4,332	555	20
15256	Albert Builder	do		Oct. 10	18.09	14.06	13.46	78.00			540	19
15386	Felix Barth	do		Oct. 15	17.67	14.68	13.94	83.10			883	31
15438	J. C. Roper	do	German	Oct. 16	14.58	10.93	10.38	75.00			953	34
15541	Gustav Thomas	do		Oct. 19	13.65	9.30	8.84	68.10			877	31
15697	A. C. McCully	do	Vilmorin	Oct. 21	17.79	14.25	13.48	80.20			1,010	36
16071	W. H. Carpenter	do	Imperial	Nov. 2	15.89	12.40	11.78	78.00	17.6	2,918	490	17
16180	John H. Campbell	do	German	Nov. 5	20.07	15.90	15.11	79.20			570	20
16594	T. S. McMurray	do	do	Nov. 29	27.29	22.50	21.37	82.40			80	8
16271	L. S. Rouse	do	Kleinwanzlebener	Nov. 9	15.95	11.30	10.74	70.80			643	23
	Average				17.98	13.99	13.29	77.20	20.0	3,625	660	23
15444	Plymouth Farmers' Club	Sheboygan	Kleinwanzlebener	Oct. 16	16.58	11.46	10.89	69.10			430	15
15716	N. Winegartner	do		Oct. 22	12.68	9.30	8.84	73.30			1,800	64
15720	Mrs. Laycock	do	German	Oct. 22	15.28	12.00	11.40	78.60			1,100	39
15842	A. F. Hyatt	do		Oct. 26	14.55	11.40	10.83	78.40			1,107	39
16240	George Pieper	do	Kleinwanzlebener	Nov. 7	19.39	16.45	15.63	84.90			860	38
15517	H. M. Groeneveld	do		Oct. 19	13.35	8.95	8.48	67.00			510	18
16266	Peter Doane	do	French	Nov. 9	15.65	10.40	9.88	65.50			737	26
	Average				15.35	11.42	10.85	75.30			935	33
15261	George Hartung	Taylor		Oct. 10	18.69	15.95	15.15	85.30			310	11
15303	Fred. Moser	do		Oct. 12	15.28	10.76	10.22	70.00			540	19
15335	F. Lindow	do		Oct. 13	16.42	12.24	11.63	74.60			700	25
15343	Franz Helwig	do		Oct. 13	12.12	8.84	8.40	73.00			500	18
15497	F. H. Wehmann	do		Oct. 17	15.08	10.94	10.49	72.50			665	23
15531	J. Reinolt	do		Oct. 19	15.85	11.80	11.21	74.40			460	16
15538	J. Frank	do	Kleinwanzlebener	Oct. 19	15.57	13.05	12.40	83.80			420	15
15540	Karl F. Hanel	do		Oct. 19	15.47	12.50	11.88	80.80			473	17

15701	F. L. Dietrich	do		Oct. 22	13.18	9.00	8.55	67.30			1,080	38
15703	do	do		Oct. 22	13.38	9.65	9.18	72.10			1,050	37
15805	Fred. Willener	do		Oct. 24	14.85	11.60	11.02	78.10			637	22
15964	George Schuhart	do	Kleinwanzlebener	Oct. 29	15.63	12.20	11.59	78.10			730	26
16087	Thomas Brehm	do		Nov. 2	15.59	11.15	10.59	71.50			1,230	43
16329	Fred. Hochfeldt	do	French	Nov. 10	17.69	14.00	13.30	79.10	14.2	2,695	675	24
15332	Jos. Erben	do		Oct. 13	15.62	12.31	11.70	78.90			600	21
	Average				15.36	11.73	11.15	76.00	14.2	2,695	671	24
15226	M. J. Warner	Trempealeau	German	Oct. 9	15.83	12.24	11.62	77.30			490	17
15227	do	do	do	Oct. 9	15.50	11.45	10.88	73.90			520	18
15229	Robert Warner	do	White	Oct. 9	16.53	12.59	11.96	76.30			520	18
15232	Thomas Matchie	do	German	Oct. 9	12.03	7.91	7.50	65.90			1,330	47
15253	do	do		Oct. 9	11.28	7.38	7.01	65.30			1,040	37
15754	B. Tollefson	do		Oct. 23	16.97	13.20	12.54	77.80			755	27
16079	Peter H. Claussen	do ?		Nov. 2	18.31	14.75	14.01	80.60	12.6	2,568	285	10
	Average				15.21	11.36	10.79	73.90	12.6	2,568	706	25
15435	A. H. Rolfe	Vernon	German	Oct. 16	13.08	9.23	8.77	70.60			987	35
15532	J. B. Johnson	do		Oct. 19	13.65	10.40	9.88	76.20			693	24
15627	P. M. Randall	do		Oct. 20	16.08	12.00	11.40	74.60			710	25
15663	James P. Riley	do	Kleinwanzlebener	Oct. 21	13.41	9.65	9.17	72.00			1,095	39
15665	M. F. Hopkins	do		Oct. 21	18.73	15.04	14.13	82.20			470	17
15706	F. C. Clark	do		Oct. 22	15.39	13.55	12.87	88.00			815	29
15707	Harry Clark	do		Oct. 22	16.59	14.01	13.40	85.00			525	29
16267	F. H. Buchanan	do		Nov. 9	16.77	13.30	12.64	79.30			773	27
16068	Adam Newland	do		Nov. 2	15.09	10.05	9.55	66.60			1,300	46
16077	Edgar Eno	do		Nov. 2	16.81	13.75	13.06	81.80			420	15
	Average				15.56	12.10	11.49	77.60			779	29
15480	J. B. Smith	Walworth	German	Oct. 17	15.78	11.67	11.09	74.00			530	19
15490	William Zohrlaut	do		Oct. 17	14.58	11.01	10.46	75.50			1,060	37
15543	Chas. V. Weeks	do		Oct. 19	14.35	10.80	10.26	75.30			1,140	40
15612	William McDonald	do	Kleinwanzlebener	Oct. 20	15.58	11.50	10.93	73.80			1,270	45
15757	H. H. Wade	do	do	Oct. 23	15.35	11.90	11.30	77.50			967	34
16076	H. Larson	do		Nov. 2	19.61	15.75	14.96	80.30			480	17
16269	Bert Lester	do		Nov. 9	15.95	11.30	10.74	70.90			1,050	37
16394	A. W. Arwood	do	German	Nov. 14	17.87	14.55	13.82	81.40			473	17
15753	M. J. Bagley		do	Oct. 23	14.75	8.40	6.80	57.00			1,177	42
	Average				15.98	11.88	11.15	74.00			905	32
15554	Andrew Dahlstrom	Washburn	Kleinwanzlebener	Oct. 19	13.95	11.35	10.78	81.40			250	9
15436	Sam Salter	Washington		Oct. 16	13.58	9.82	9.33	72.30	13.1	1,594	1,550	58
15629	William Row	do		Oct. 20	15.28	10.20	9.69	66.80			983	32
15626	A. R. Munger	do		Oct. 20	15.28	11.00	10.45	72.00			973	34
16183	William Meier	do		Nov. 5	18.97	14.30	13.59	75.30			560	20
16320	F. Van Rhienen	do	German	Nov. 10	20.49	18.80	17.86	91.80			640	23
16321	do	do	French	Nov. 10	19.47	17.20	16.34	88.30			597	21

Summary of results by States and counties—Continued.

WISCONSIN—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets. Grams.	Average weight of beets. Ounces.
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
16322	John Gebhardt	Washington	German	Nov. 10	19.17	15.50	14.73	80.90			617	22
16323	do	do	French	Nov. 10	17.67	12.85	12.21	72.70			447	16
16326	George Gebhardt	do	German	Nov. 10	17.47	13.20	12.54	75.60			863	31
16327	do	do	French	Nov. 10	17.37	13.25	12.59	76.30			600	21
15962	M. L. Barney	do	German	Oct. 29	17.03	13.20	12.54	77.50			677	24
	Average				17.43	13.57	12.90	77.23	13.1	1,597	773	27
15180	John E. Hughes	Waukesha		Oct. 16	12.95	9.23	8.77	71.30			950	34
15213	do	do		Oct. 8	14.88	10.58	10.05	71.10			950	34
15518	S. A. Baird	do	Imperial	Oct. 19	14.05	8.65	8.22	61.60			1,483	52
15520	H. T. Jeffrey	do		Oct. 19	14.65	10.35	9.83	70.70			947	33
15699	Walter D. Anstey	do		Oct. 22	12.18	8.10	7.70	66.50			1,153	41
15856	James Bias	do	Kleinwanzlebener	Oct. 26	15.97	13.20	12.54	82.70			937	33
16066	A. J. Fraser	do		Nov. 2	16.81	13.00	12.35	77.40			1,300	46
16268	Frank Peardon	do	Kleinwanzlebener	Nov. 9	18.15	12.30	11.69	67.80			570	20
16401	J. J. Friney	do	do	Nov. 14	17.57	13.35	12.68	76.00			690	24
15841	Magnus Andree	do		Oct. 26	17.77	14.10	13.40	79.30			890	31
15944	W. C. De Wolf	do	Kleinwanzlebener	Oct. 28	15.85	13.65	12.92	86.10			950	34
15632	John Wright	do		Oct. 20	14.48	9.85	9.56	68.00			1,330	44
15614	Geo. W. Bancroft	do		Oct. 20	17.79	14.65	13.92	82.40			720	26
16324	J. Greif	do	German	Nov. 10	16.55	11.90	11.31	71.90			657	23
16325	do	do	French	Nov. 10	17.15	11.70	11.12	68.20			623	22
	Average				15.79	11.64	11.07	73.40			943	33
15299	P. L. Van Epps	Waupaca		Oct. 12	15.28	11.56	10.97	75.50			910	32
15331	Aug. Kussmann	do		Oct. 13	13.93	10.49	9.96	74.90			1,020	36
15548	Fred Bohlman	do		Oct. 19	14.85	11.70	11.11	78.80			220	8
15553	F. E. Koeller	do	White	Oct. 19	15.87	12.45	11.82	78.50			910	32
15625	H. W. Kirkholfer	do	German	Oct. 20	14.28	10.50	9.98	73.50			517	18
15755	George Williams	do		Oct. 23	15.05	11.40	10.83	75.80	15.4	2,281	377	13
15800	H. J. Leed	do	German	Oct. 24	17.27	14.40	13.68	83.20			733	26
15961	August Pidde	do		Oct. 29	15.53	11.75	11.16	75.70			1,290	46
16038	R. H. Hall	do	German	Oct. 31	17.17	14.15	13.44	82.40			500	18
16067	Daniel Marshall	do		Nov. 2	16.49	11.75	11.16	70.90			1,000	35
16072	William Brehmer	do	Imperial	Nov. 2	17.31	13.00	12.35	75.10			480	17

16182	Evan Townsend	do		Nov. 5	18.37	14.30	13.59	77.90	8.3	1,565	630	22
	Average				15.99	12.29	11.67	76.85	11.85	1.923	716	25
15488	John G. Reinke	Waushara	German	Oct. 17	13.38	9.36	8.89	70.00			703	25
15854	C. A. Davenport	do	Kleinwanzlebener	Oct. 26	16.55	12.00	11.40	72.50			567	20
15959	E. Port	do	German	Oct. 28	18.17	13.75	13.03	75.80	15.2	2,719	360	13
15097	do	do			16.73	13.29	12.65	79.40			220	8
	Average				16.21	12.10	11.49	74.40	15.2	2,719	463	17
15440	F. T. Tegtmeir	Winnebago		Oct. 14	14.58	10.53	10.00	72.20			510	18
15447	A. P. Shelton	do		Oct. 14	16.68	12.65	12.02	75.90			560	20
15619	John Barris, jr	do	Kleinwanzlebener	Oct. 20	15.48	11.75	11.16	75.90			1,240	44
15622	M. B. Green	do		Oct. 20	17.58	12.10	11.50	68.80			720	25
15633	John F. Miller	do		Oct. 20	15.28	11.15	10.60	73.00			703	25
15671	Petter Tenneson	do		Oct. 21	17.63	13.60	12.92	77.20			447	16
15916	J. L. Knott	do	Kleinwanzlebener	Oct. 27	15.72	11.75	11.16	74.70			710	25
16073	J. W. Tobey	do	Imperial	Nov. 2	16.79	12.15	11.54	72.40			410	14
16080	W. W. Noble	do	German	Nov. 2	17.11	13.75	13.06	80.50	18.3	3,673	530	19
	Average				16.32	12.16	11.55	74.50	18.3	3,673	648	23
15302	William S. Millen	Wood		Oct. 12	13.28	10.36	9.84	77.90			630	22
15441	Carl H. Wood	do	Kleinwanzlebener	Oct. 16	15.68	12.37	11.75	78.90			483	17
15710	Ezra Letwan	do		Oct. 22	13.38	10.50	9.97	78.30			700	25
15803	Mrs. B. R. Tarbox	do	German	Oct. 24	13.65	9.25	8.79	67.70	13.4	1,478	1,175	45
15799	do	do		Oct. 24	13.55	10.00	9.50	73.90			1,690	60
16272	J. S. Lindahl	do		Nov. 9	13.85	9.45	8.98	68.30			1,500	53
16588	Peter Schultz	do		Nov. 27	21.79	16.30	15.48	74.80			220	8
16589	do	do		Nov. 27	22.09	16.20	15.38	73.40			250	9
15721	F. E. Taylor	do	German	Oct. 22	16.09	12.65	12.04	78.60			690	24
	Average				15.93	11.90	11.30	74.60	13.4	1,478	815	29
	Average of State				15.35	11.64	11.05	75.80	16.1	2,833	742	26

WYOMING.

15462	Dice McLaren	Albany	La Plus Riche	Oct. 16	19.69	16.09	15.29	81.70	3.3	744	180	6
15463	do	do	Kleinwanzlebener	Oct 16	19.09	15.92	15.12	83.40	3.9	888	215	8
15464	do	do	Desprez	Oct. 16	18.69	15.53	14.75	83.10	5.7	1,216	145	5
15465	do	do	Vilmorin Improved	Oct. 16	20.39	16.87	16.03	82.70	4.4	1,052	200	7
15466	do	do	Kleinwanzlebener	Oct. 16	19.79	15.88	15.09	80.30	4.1	897	260	9
15467	do	do	do	Oct. 16	18.19	14.59	13.86	82.40	8.9	1,833	205	7
15468	do	do	Vilmorin	Oct. 16	17.09	12.77	12.13	74.70	10.2	1,669	235	8
	Average				18.99	15.38	14.61	81.20	5.8	1,186	206	7

Summary of results by States and counties—Continued.

WYOMING—Continued.

Serial No.	Name of grower.	County.	Variety.	Date received.	Total solids.	Sucrose in— Juice.	Sucrose in— Beet.	Purity.	Yield beets per acre.	Probable yield sucrose per acre.	Average weight of beets.	
						Per ct.	*Per ct.*	*Per ct.*	*Tons.*	*Pounds.*	*Grams.*	*Ounces.*
15746	J. D. Parker	Carbon		Oct. 22	15.38	12.00	11.40	77.9	13.5	2,163	320	10
15370	Thomas A. Dunn	Crook	French	Oct. 13	15.32	11.86	11.27	77.5			730	26
16061	C. E. Lincoln	do	Vilmorin	Oct. 31	19.77	14.00	13.30	70.8	18.7	3,677	470	17
16062	do	do	Kleinwanzlebener	Oct. 31	21.47	15.75	14.96	73.3	18.7	3,700	480	17
	Average				18.85	13.87	13.18	73.9	18.7	3,689	560	20
15689	J. S. Meyer	Fremont		Oct. 21	16.73	13.50	12.83	80.7	18.9	3,456	425	15
15690	Simeon Morgridge	Johnson	French	Oct. 21	18.13	14.00	13.30	77.2			625	22
15658	Wheatland Exp. Farm	Laramie	German	Oct. 20	16.99	13.7	13.02	80.7	20.5	3,887	240	9
15074	R. M. Walker	do	French	Sept. 23	13.61	9.87	9.38	72.5			1,155	41
16165	A. C. Hubbard	do	Vilmorin	Nov. 4	19.44	15.00	14.25	77.2	13.9	2,761	245	9
16166	do	do	Kleinwanzlebener	Nov. 4	19.24	13.50	12.83	70.2	11.5	1,868	275	10
	Average				17.32	13.02	12.37	75.2	15.3	2,839	479	17
15383	Geo. A. Becker	Sheridan		Oct. 14	18.17	14.54	13.81	80.0	10.7	2,135	180	6
	Average of State				18.18	14.19	13.48	78.1	11.1	2,130	369	12

NOTES ON THE ANALYSES OF BEETS FROM THE DIFFERENT STATES AND TERRITORIES.

Arizona.—Only two samples were received from this Territory. They were both very much overgrown, being about three times as large as the normal beet should be. As would be expected the content of sugar was very low, the average of the two samples being 7.69 per cent.

Arkansas.—Only two samples were received from this State. In the first one the beets were of a normal size, weighing 18 ounces, nevertheless the content of sugar was very low. In the second the beets were very much overgrown, averaging 62 ounces.

California.—Eight samples were received from this State. The average size of the beets was entirely too large, being 48 ounces. The average percentage of sugar in the various samples was 11.06. The highest percentage of sugar was 13.35, with a beet weighing 23 ounces, and the lowest was 8.35 in a beet weighing 62 ounces. The average yield per acre as reported was 14.2 tons, showing a theoretical yield of sugar of 2,188 pounds.

Colorado.—The number of samples from this State was forty-seven, representing ten counties. The average percentage of sugar as found in the samples was 13.08, and the average weight of the beets 26 ounces. Some of the samples gave phenomenally high percentages of sugar; especially is that true of the samples from Yuma County, which, however, were very much undergrown, averaging only 6 ounces. The county making the best showing, all things considered, is Arapahoe, where the average content of sugar in the beet was 14.27, and the average weight of the beet 21 ounces. No better agricultural result than this could be desired, in so far as the size of the beet and the content of sugar are concerned.

Connecticut.—Five samples were received from the State of Connecticut. The mean content of sugar was 10.77, and the average weight of the beets 27 ounces.

Georgia.—Two samples were received from the State of Georgia, both from Clarke County. The average content of sugar in the two samples was 11.03, and the average weight of the beets 12 ounces.

Idaho.—One sample was received from Idaho; it had a content of sugar of 12.73, and a weight of 15 ounces.

Illinois.—Thirty-six samples were received from the State of Illinois, representing fourteen counties. The average content of sugar was 11.73, and the average weight of the beet was 32 ounces. The best showing among the counties was made by Lee, which showed an average content of 13.61 of sugar in the beet, and an average weight of beet of 34 ounces. This is a remarkably high content of sugar considering the size of the beet produced. All the samples from this county showed high results. Another county showing excellent results was Cook, where the average content of sugar was 13.48 and the average weight of beet 44 ounces. It is very rare to see so high a sugar content with a beet of such size.

Indiana.—Seventy-one samples were received from the State of Indiana, representing eighteen counties. The average content of sugar for the samples for the whole of the State was 11.64, and the average weight of the beets 27 ounces. Among the counties Wabash has the best results, showing 13.45 per cent of sugar in the beet, with an average weight of 30 ounces. All the samples except one received from that county showed good results. The highest sugar was 13.58, obtained in Clinton County, from which, however, only two samples were received. This would make it rather unfair to compare it with the other counties sending a larger number of samples. Kosciusko County also made a good showing, with an average percentage of 11.93 of sugar in the beet, from 16 samples, being the largest number received from any one county in the State.

WORK CONDUCTED BY THE AGRICULTURAL EXPERIMENT STATION OF INDIANA.

Prof. H. A. Huston, chemist of the Experiment Station of Indiana, conducted an extensive series of experiments with sugar beets during the season of 1891, the results of which are printed in Bulletin No. 39 for April, 1892.

A large number of samples of seeds was sent to farmers in different parts of the State and 65 samples of beets were sent in for examination. The mean percentage of sugar in the juice of the beets and their mean average weight in ounces are as follows:

Sugar in the juice, per cent	12.8
Weight of beets, ounces	20.7

Sixty-six samples of beets grown on the experimental farm of the station were also examined and found to contain 12.4 per cent of sugar in the juice. The average weight of the beets is not given in these samples, with the exception of six, and so no comparison can be made.

As a result of the experiments it is concluded that the station will be justified in making tests in all parts of the State so that all the different characteristics of the soil in the State can be thoroughly studied with reference to the character of beets which can be grown upon it.

A table is given of the relative amount of sugar in three typical sizes of beets:

Fifteen large beets weighing 40 pounds contained 4 pounds and 4 ounces of sugar.

Thirty-nine beets of medium size weighing 40 pounds contained 4 pounds and 14 ounces of sugar,

Ninety-six small beets weighing 40 pounds contained 5 pounds and 10 ounces of sugar.

A table is also given showing the influence on the size of the beets and the amount of sugar present in them from planting at different seasons.

In the summary it is said that the results of the last year certainly justifies the station to continue the experiments with sugar beets in Indiana, and are favorable to the establishment of a beet-sugar industry in the State. There seems to be little doubt that beets with a good percentage of sugar and with sufficiently pure juice can be grown. The fertility of Indiana lands is well enough known to insure an abundant yield when proper methods of cultivation are followed. The geographical location of the State; its position in the center of a group of large markets; its cheap fuel, gas, petroleum, and coal; its relatively pure waters; its highly efficient transportation facilities by land and water, all favor the introduction of the industry.

A valuable report on diseases affecting the sugar beet is introduced by Prof. J. C. Arthur and Miss Katherine E. Golden.

Iowa.—Three hundred and twenty-two samples were received from the State of Iowa, representing sixty-one counties. The mean content of sugar in the samples was 11.82 and the mean weight of the beets 30 ounces. From Marshall County were received thirty-four samples, showing an average content of 11.54 of sugar in the beet and an average weight of 21 ounces. From Muscatine County were received thirty-three samples, showing 14.10 per cent of sugar in the beet and an average weight of 26 ounces. This is a magnificent showing, and indicates that in this county the beets must have been cultivated in accordance with the directions sent, or that the soil of the county is especially suited to the growth of the sugar beet. There is only one sample among the whole number that can be considered as poor, while many of them are above the average in richness. It can not be that, among so many samples, good results are due to accident. Thirty-one samples were received from Scott County, showing an average of sugar in the beet of 12.63 and an average weight of 29 ounces. This is also a most encouraging result. Nineteen samples were received from Dallas County, showing an average of 11.96 of sugar in the beet and an average weight of 23 ounces. This is also an encouraging result. Eighteen samples were received from Allamakee County, showing an average content of sugar in the beet of 12.64, and an average weight of beet of 40 ounces. This must also be regarded as a high content of sugar, considering the excessive size of the beets. The above comprises all the counties sending a large number of samples. Many of the counties sending a smaller number of samples show excellent results, but of course the greater reliance must be placed on those counties from which the larger number of samples was received.

It will be interesting to compare these results with those obtained at the experiment station at Ames. This institution distributed large quantities of seed, received chiefly from the Department of Agriculture, and had samples sent directly to the laboratory at the station for examination, where they were analyzed by Prof. G. E. Patrick. Experi-

ments were made upon the station grounds with different varieties, which yielded the following results:

No.	Date of planting.	Variety.	Soil conditions.	Yield per acre in tons.	No. of beets in sample taken Sept. 30.	Mean weight.	Percentage of sugar in beets.	Purity of juice.	No. of beets in sample taken Oct. 12.	Mean weight.	Percentage of sugar in beets.	Purity of juice.
						oz.				oz.		
1	Apr. 15	German	Upland sandy loam	28.163	10	16.7	14.62	77.7	11	27.5	11.49	75.3
2	May 25	French	Low rich loam	21.28	12	20.0	12.19	72.5	15	16.0	12.19	75.5
3	May 25	...do	Medium sand loam	24	14	12.5	13.02	75.5	15	10.0	12.13	75.2
4	May 9	...do	Low rich loam....	25.76	10	36.5	11.09	72.1	8	37.5	11.32	73.5
5	May 13	...do	Timber clay loam .	17.6	12	12.5	14.47	80.1	15	12.5	13.80	78.3
6	May 13	German.	....do	15.86	13	11.5	15.73	78.3	11	11.0	14.12	80.1
7	May 20	...do	Same as No. 1 and lime.	18.5	11	20.0	11.87	70.4	12	12.0	12.89	76.9
8	May 20	...do	Same as No. 1 and sugar fertilizer.	18.3	11	15.5	13.15	76.0	9	10.0	13.02	73.8
9	May 20	...do	Same as No. 1 and vegetable fertilizer.	19.1	12	12.0	14.21	76.2	13	15.5	11.72	70.8
10	May 25	...do	Same as No. 1, subsoiled.	19.36	12	16.0	13.45	75.8	12	10.5	13.46	77.3
11	May 13	French .	Stiff timber clay ..	8.5	12	9.0	15.41	51.0	11	9.5	14.29	78.2
12	May 13	Desprez	Timber clay loam .	12.32	13	11.5	15.71	82.5	10	12.5	15.05	85.4

No.	Date of planting.	Variety.	Soil conditions.	No. of beets in sample taken Nov. 6.	Mean weight	Percentage of sugar in beets.	Purity of juice.	Average per cent of sugar in beets.	Average purity of juice.
					oz.				
1	Apr. 15	German .	Upland sandy loam	10	20.5	12.77	74.3	12.96	75.7
2	May 25	French ..	Low rich loam	15	15.5	12.72	74.0	12.36	74.0
3	May 25	...do	Medium sand loam..............	13	14.5	13.44	76.6	12.86	75.4
4	May 9	...do	Low rich loam	11	55.0	12.17	72.8	11.52	72.8
5	May 13	...do	Timber clay loam................	18	11.0	14.65	76.9	14.30	78.4
6	May 13	German..	......do	17	14.5	14.29	76.7	14.71	78.3
7	May 20	...do	Same as No. 1 and lime..........	14	15.5	13.46	73.5	12.74	73.6
8	May 20	...do	Same as No. 1 and sugar fertilizer.	10	11.0	14.62	71.9	13.59	73.5
9	May 20	...do	Same as No. 1 and vegetable fertilizer.	13	12.5	13.66	72.1	13.19	73.0
10	May 25	...do	Same as No. 1, subsoiled	14	9.0	15.92	73.9	14.27	77.0
11	May 13	French ..	Stiff timber clay	12	9.0	14.84	79.0	14.84	79.4
12	May 13	Desprez .	Timber clay loam.................	14	14.0	15.17	79.1	15.31	82.3

The experiment station field consisted of 1.3 acres. The cost of cultivation and harvesting was $51.25, or at the rate of $39.42 per acre.

The beets were grown in rows 23 inches from center to center and the plants were thinned to 8 inches apart in the rows. The chief conclusions drawn from the experimental work at the station were as follows:

(1) Early planting gave the greatest tonnage and the most sugar per acre.

(2) Very large beets did not sugar well.

(3) Subsoiling gave the best-shaped beets and the highest per cent of sugar in November, needing the least trimming.

(4) Cutworms destroyed most of our early plantings, but did not affect the later plantings.

(5) Per cent of sugar was affected by second growth in October or by absorbing moisture from the rains after long drouth, or both.

(6) Yield per acre has much to do with the profitableness of the crop; and

(7) While our highest analysis came from beets averaging 13 ounces, trimmed, and yielding 12.32 tons per acre, our largest yield of sugar per acre came from beets averaging 21 ounces, trimmed, and yielding 28.163 tons per acre.

(8) Clay soil gave us the highest per cent of sugar and comparatively higher purity and the lowest tonnage per acre.

(9) Three plats fertilized with lime, nitrogen, phosphoric acid, and potash, gave no evident benefit.

(10) The average per cent of sugar was 14.14, and the average yield about 20 tons an acre, and the cost of growing and harvesting $39.42 an acre. The highest sugar in beets, per acre, was 7.299 pounds.

The foregoing comments on the work were taken from the bulletin of the station No. 15. From the same bulletin, also, the following extracts are taken, relating to the experiments made by the farmers in the different parts of the State of Iowa.

In all 502 samples were received, and fifty-one counties were represented. The average percentages of sugar in the beets as analyzed at the Iowa Experiment Station laboratory, were as follows:

County.	Percentage.	County.	Percentage.
Dickinson	12.89	Mitchell	12.10
Allamakee	12.13	Chickasaw	13.21
Plymouth	10.29	Buena Vista	10.34
Pocahontas	8.89	Wright	13.22
Fayette	12.45	Clayton	11.80
Ida	9.50	Sac	9.94
Webster	11.04	Hamilton	11.31
Hardin	11.77	Grundy	11.76
Black Hawk	11.03	Carroll	12.08
Greene	9.73	Boone	9.58
Story	10.57	Linn	10.76
Shelby	8.32	Guthrie	6.91
Dallas	11.57	Polk	11.35
Jasper	10.82	Warren	10.89
Marion	10.54	Poweshiek	11.89
Cedar	11.50	Scott	13.44
Cass	10.50	Warren	11.53
Mahaska	7.65	Keokuk	8.87
Montgomery	9.26	Adams	12.20
Union	12.04	Page	9.74
Taylor	12.98	Decatur	7.51

On account of the large number of samples received from Muscatine County the analyses are divided into three groups. The first group contained 53 samples and had a mean percentage of sugar in the beet of 11.96. The second group contained 61 samples and had a mean percentage of sugar in the beet of 12.29. The third group contained 96 samples and contained a mean percentage of 13.64 of sugar in the beet. This is also a remarkable showing, and corresponds with the results obtained on the beets from this county analyzed in the laboratory of the Department of Agriculture, where 31 samples showed an average of 14.11 per cent of sugar. Certainly no further evidence than this will be needed to convince anyone that the county of Muscatine, in Iowa,

judging at least by one season's work, is extremely well adapted to the production of sugar beets of high quality.

In regard to the tables the following remarks are found in Bulletin 15:

The average results for different counties show in some instances wide differences in quality of the beets. But wide differences are also found between the beets grown on different farms in the same county, and even between those of different plats or fields of the same farm. Some of these differences may be, probably are, due to the soil itself, but without doubt very many are due to the modes of preparing the soil and cultivating the crop. Therefore it is not safe to assume that the relative adaptability of the different counties to the beet-sugar industry is truly, or even approximately, represented by the results of a single year's investigation—and this is of course especially true of those counties from which but few samples were received.

It is true the results of the State as a whole do not indicate as high an average quality of beet as is reported from some States in the drier regions further west and northwest; but on the other hand the average yield of beet per acre is in Iowa very much larger than is possible in those States, without irrigation. Therefore, even should this indication regarding quality be in future verified (it is now only an indication), that difference would probably be more than balanced by the superior yield per acre possible with the soil and climate of Iowa. It is generally asserted, and doubtless with truth, that for profitable sugar manufacture there is required an average quality of beet represented by a sugar content of at least 12 per cent (on the beet) and a purity coefficient of nearly 80 or upwards. But quality of beet is not all. Plainly, the yield of beets per acre is an equally important factor in determining profit.

Kansas.—Thirty-six samples were received from the State of Kansas, representing seventeen counties. The mean results for the whole State were, sugar in the beet, 10.69, and average weight of beet, 33 ounces. The counties showing good results were Harvey, two samples averaging 3.61 of sugar in the beet, with an average weight of 22 ounces; and Edwards County, one sample with 14.8 per cent of sugar in the beet and with an average weight of 43 ounces. This is a very high result considering the size of the beet.

EXPERIMENTS WITH BEETS AT THE SORGHUM EXPERIMENT STATION, STERLING, KANSAS.

An acre and a half was planted in beets, of the Vilmorin and Kleinwanzlebener varieties. The land was plowed in the fall; in the spring it was plowed and also subsoiled to a depth of 12 inches. The seed was planted April 15, in rows 18 inches apart, at the rate of 15 pounds per acre. The expense of growing the beets, including rent of land at $3.50 per acre, labor at $1.50 per day, seed at 25 cents per pound, and the expense of harvesting, not including hauling the beets, was $72.

The beets yielded 17 tons per acre of clean, topped beets. The average per centage of sugar in the beets, when harvested, was 11.97. The purity was 80. Assuming that the beets were worth $3 per ton, the crop was worth, at a factory, $76.50. It is believed that by planting in 30-inch rows, using a horse cultivator instead of performing all the labor by hand, and having experience in beet growing, the expense could be lessened and the profit could be increased. On this point the conclusions of the Wisconsin Experiment Station appear correct.

Kentucky.—Three samples were received from the State of Kentucky, representing two counties. The average percentage of sugar in the beets was 9.12 and the average weight of the beets 34 ounces.

Maryland.—Only two samples were received from this State, both from Prince George County. The mean content of sugar was 7.36 per cent and the mean weight of the beets 16 ounces.

Michigan.—Fifty samples were received from the State of Michigan, representing twenty-one counties. The average percentage of sugar in the beets was 12.64 and the average weight of beet 32 ounces. The results from the State are very encouraging. Allegan County leads the list of counties with a percentage of sugar in the beet of 16.34 and an average weight of beet of 20 ounces, obtained from three samples. Osceola County comes next with an average percentage of sugar in the beet of 15.40 and an average weight of beet of 25 ounces. Next comes Gratiot with four samples, with an average of 14.36 per cent of sugar in the beet and an average weight of beet of 20 ounces. The number of samples from any one county is not large, yet on the whole the results show that Michigan is particularly well adapted to the growth of sugar beets of high quality.

Extensive experiments were conducted in Michigan by Dr. R. C. Kedzie, chemist of the Agricultural Experiment Station, during the season of 1891. The results are published in Bulletin 82 of the Michigan Agricultural Experiment Station.

The tabulation of the results is made by districts. The western district, consisting of five counties, reported an average of 15 tons of beets per acre, with a sugar percentage in the juice of 14.23. The southeastern district, consisting of four counties, reported an average of 16.5 tons per acre and an average percentage of sugar in the juice of 13.52. The central district, consisting of four counties, reported an average of 13 tons per acre and 14.33 per cent of sugar in the juice. The northeastern district, consisting of three counties, reported an average of 15 tons per acre and 13.29 per cent of sugar in the juice.

Dr. Kedzie states that from the standpoint of the manufacturer the outlook is promising. An average of nearly 14 per cent of sugar and a coefficient of purity of above 80 renders the prospect of making sugar at a profit extremely flattering. He advises investors to be slow about establishing a sugar factory and to consider all the problems connected therewith before investing their money. This is certainly very good advice.

It is announced that the station will not undertake further experiments in the distribution of beet seed and the investigation of the subject of sugar-making, and this is certainly a subject of regret. With such promising results as have been obtained by Dr. Kedzie, there are certainly very good reasons for going ahead and making a thorough study of the State in regard to its sugar-producing properties.

The total number of samples examined was 229, and the mean results of the average weight, average percentage of sugar in the juice, and average coefficient of purity are as follows:

	Grams.	*Ounces.*
Average weight of beets	992.25	35
Per cent sugar in juice	13 79	
Purity coefficient	86.30	

These results are certainly of the most encouraging character. The content of sugar is remarkably high when the overweight of the beets is taken into consideration.

Minnesota.—Forty-one samples were received from the State of Minnesota from eighteen counties. The average per cent of sugar in the beet was 12.38, average weight of 29 ounces. The county showing the

highest results was Polk, averaging 15.42 per cent of sugar in the beet and 30 ounces in weight. Next on the list comes Goodhue County with four samples, averaging 15 per cent of sugar and 20 ounces in weight. Next Faribault, with four samples, averaging 12.42 percentage of sugar and 27 ounces in weight.

Missouri.—Sixty-seven samples were received from the State of Missouri. The average percentage of sugar in the beet for the whole State was 10.42, and the average weight of beets 20 ounces. The best result is reported from Caldwell County, showing 15.41 percentage of sugar in the beet and a weight of 12 ounces. The next best result is from Knox County, four samples with an average of 13.36 per cent of sugar in the beet and an average weight of 9 ounces. This must not be considered a very high content of sugar for beets so greatly undergrown. The low result in this State as a whole is due to the belated samples sent by the State Experiment Station. These samples were not received until late in January and some of them were in a very poor condition. Especially hard on the State average are the results of Nos. 16670 and 16671, comprising samples of beets wholly unfit for any use.

Quite remarkable, however, is the result reported from Livingston County. One sample weighing 64 ounces contained 11.96 per cent of sugar. On the whole it appears that had the beets grown in Missouri been cultivated under proper scientific conditions so as to keep the size down to the normal, the content of sugar in them would have compared favorably with that of any other State.

Montana.—Forty-one samples were received from this State, representing five counties, of which Gallatin County furnished thirty. The average content of sugar for the State was 13.23, and the average weight of the beets 25 ounces. Gallatin County, with thirty samples, shows an average content of sugar in the beet of 13.75 and an average weight of beet of 20 ounces. This is certainly a most excellent result. The highest percentage in the samples is found in those from Missoula County, containing 15.82 per cent of sugar in the beet and having an average weight of 28 ounces. There were, however, only two samples from this county. The next best result is also from a county which furnished only two samples, Lewis and Clarke County, showing an average content of sugar in the beet of 15.46, and an average weight of beet of 19 ounces.

Nebraska.—The number of samples received from Nebraska was sixty-two, representing twenty-nine counties. The average content of sugar in the beet for the whole State was 11.67 and the average weight of the beet 35 ounces. Among the counties showing the highest results may be mentioned Richardson, one sample having 15.82 per cent of sugar and a weight of 13 ounces. Howard County, two samples, averaging 14.54 per cent of sugar and 24 ounces in weight. Boxbutte County sent two samples showing 16.22 per cent of sugar and an average weight of 31 ounces. Saline County, two samples, showing 14.21 per

cent of sugar and an average weight of 30 ounces. From some of the counties in Nebraska very poor samples of beets were received, and these tend to lower the average of the whole State. In many of the counties the results compare favorably with those from any part of the country.

EXPERIMENTAL WORK CONDUCTED BY THE EXPERIMENT STATION OF NEBRASKA ON SUGAR BEETS.

Conducted by Profs. NICHOLSON and LOYD.

[Abstract of results in Bulletin 21 of the Nebraska Station.]

The work was divided into two sections, viz, the first section conducted on the experimental farm of the station, and the second section conducted by distributing seeds to various localities throughout the State and analyzing the samples received from the different growers.

Phenomenal yields were obtained on the station plats.

Plat A yielded 34 long tons per acre with a sugar content of 14.8 per cent.

Plat B yielded 31 long tons per acre with 13.0 per cent of sugar.

Plat C yielded 31.3 long tons per acre with 13.5 per cent of sugar.

Plat D yielded 30.5 long tons per acre with 14.2 per cent of sugar.

Plat E yielded 30.8 long tons per acre with 12.9 per cent of sugar.

Another series of experiments was made to test the value of agricultural implements, and a third series to determine the effect of fertilizers. Bone dust, kainit, nitrate of soda, guano, and phosphate were used singly and in mixtures without any appreciably good effect upon the sugar content or tonnage of the beets. The average yield in tons per acre from these various plats was 15.5, and the average content of sugar 13.3 per cent. The average cost per acre of the different plats harvested and placed in the silo varied from $32.75 to $29.14.

As a result of the whole study it was found that the newer ground not subsoiled yielded on the average about 13 tons of topped beets per acre; whilst the same ground, that had been thoroughly stirred to a depth of 16 inches, gave an average yield of nearly 16 tons to the acre; while on the older ground, that which for a long time had been under thorough cultivation, and had been thoroughly subsoiled, the average yield rose to 31.5 tons.

It was found that in rainy weather in the autumn that by loosening the beets in the row and allowing them to remain without harvesting, the sugar was preserved better than if they were not so loosened. Comparative experiments showed that with beets loosened in the row and left standing the average percentage of sugar was 13.9, while in those which had not been loosened it dropped to 12.8.

In the second series of experiments, viz, those in which seeds were sent to the farmers, eighty-eight samples were received from the farmers, the average weight of which was 22.74 ounces, and the average percentage of sugar (presumably in the juice) reported from the analyses was 13.09.

Nevada.—Eighteen samples were received from this State, from three counties of which one, Washoe, furnished fifteen. The average percentage of sugar in the beet for the State was 17.2 and the average weight of beet 11 ounces. Washoe County, which practically furnished all the samples from the State, also leads in the quality of the beets obtained. The numbers representing their quality are almost phenomenal with the exception of the average weight, which is only about what it should be. This doubtless accounts for the fact that the beets were so exceptionally rich. The fifteen samples from this county showed an

average percentage of sugar in the beet of 18.02 and an average weight of 9 ounces.

New Hampshire.—Only one sample was received from this State, which contained 11.64 per cent of sugar and weighed 19 ounces.

New Jersey.—Only one sample was received from this State, which contained 7.33 per cent of sugar, with a weight of 17 ounces.

New Mexico.—Seventeen samples were received from the Territory of New Mexico, showing an average content of sugar of 13.8 and an average weight of 28 ounces. Eddy County, which furnished the largest number of samples, also leads the list in regard to quality, showing an average of 14.45 per cent of sugar and a weight of 27 ounces. This result is exceptionally fine and shows that the possibilities of the production of beets of high saccharine richness is very flattering.

New York.—Four samples were received from the State of New York, and the average content of sugar was 11.58 and the average weight 32 ounces. Three counties sent samples. The best sample was received from Genesee County, with 13.02 percentage of sugar and a weight of 23 ounces. Erie sent two samples with an average content of sugar of 12.25 and an average weight of 33 ounces.

North Dakota.—There were received by the Department from North Dakota eleven samples from six counties. The mean percentage of sugar for the State was 11.84, and the mean weight of the beets 23 ounces. The best results by counties were from McIntosh.

Bulletin No. 5 of the Experiment Station of North Dakota, issued in February, 1892, contains an account of the results with sugar beets in that State during the season of 1891.

Seed of the standard varieties of sugar beets was distributed to different parts of the State and one hundred and forty-four samples were received for analysis. In general it may be said that the samples were somewhat overgrown, as will be seen from the average weight. The percentage of sugar in the juice and the purity are also rather low; lower than would be expected, in fact, for that locality.

Mr. E. F. Ladd, who conducted the analyses, makes the following summary of the results:

(1) The one hundred and twenty-nine samples of beets analyzed gave an average sugar content (sucrose) of 11.43 per cent.

(2) Many of the samples of beets sent for analysis were harvested before the sugar in the beets was fully formed; in other words, before the beets were ripe.

(3) In many cases the beets had not received proper treatment and much of the root grew above ground.

(4) In many instances the ground was not plowed to sufficient depth, not more than 6 inches deep, leaving a hard, impenetrable subsoil below, and the beets grew prongy and of ill shape—such as would be rejected at the factory.

(5) To grow sugar beets for the factory the land should be plowed to a depth of 8 to 10 inches; the beets grow well in the ground, for the part above ground is of inferior quality and generally rejected at the factory.

(6) The large beets are not the best for sugar. Beets weighing above 3 pounds have a less per cent of sugar than the smaller beets.

(7) For the present it is my belief that for the most of North Dakota other industries will be found more profitable for both manufacturer and farmer than the sugar-beet industry.

It will be seen from the conclusions which he reaches and which are justly based upon the analyses made, that he is not disposed to favorably consider that the sugar beet has a promising future in North Dakota. I am inclined to the opinion, however, that with more scientific methods of culture the results obtained in North Dakota will prove much more encouraging than those secured in the last year.

From the data given in the bulletin as printed the mean figures of the samples analyzed are as follows:

Average weight of beets in grams	822.90
Per cent sugar in juice	11.36
Purity coefficient	74.00

Ohio.—Sixty-six samples were received from the State of Ohio, representing twenty counties. The average content of sugar in the beets from the whole of the State was 11.33 and the average weight of the beets 31 ounces. Morrow County is best on the list with samples, showing 16.44 per cent of sugar and an average weight of 22 ounces. Hancock County furnished rich samples, four in number, averaging 16.32 per cent of sugar in the beet and 19 ounces in weight. One of the samples, No. 26614, received from Ohio, deserves special mention on account of its high content of sugar and its high purity. It contained 20.19 per cent of sugar with a purity of 87.4. Trumbull County sent six samples, with an average of sugar in the beet of 13.12 and an average weight of 25 ounces. Ashtabula County sent two samples with an average content of sugar of 13.19 and an average weight of 25 ounces. The largest part of the samples were from Erie County, which furnished eighteen, with an average content of 11.5 of sugar and having an average weight of 32 ounces. Many of the samples from Erie County were of exceptional richness, but others were as exceptionally poor, which pulled down the average to the number given.

Oklahoma.—One sample was received from the Territory of Oklahoma, very much overgrown, showing only 6.37 per cent of sugar.

Oregon.—Thirty-five samples were received from the State of Oregon, containing an average percentage of 13.8 of sugar and with an average weight of 23 ounces. Samples were received from fourteen counties. The richest sample was received from Jackson County, showing 17.99 per cent of sugar with a weight of 20 ounces. The next best results were from Clackamas County, three samples averaging 14.78 per cent of sugar with an average weight of 21 ounces; Columbia County, three samples with an average per cent of sugar of 14.56 and an average weight of 19 ounces; Coos County, five samples, showing an average of 13.83 per cent of sugar with an average weight of 30 ounces, and Lane County, six samples, showing 13.53 per cent of sugar and averaging 20 ounces in weight. The samples from Oregon are

uniformly rich in quality, and if they truly represent the capabilities of the State, there certainly is a bright future for the beet-sugar industry on that portion of the Pacific coast.

SUGAR BEETS AT OREGON EXPERIMENTAL STATION.

Experiments were conducted by the Experiment Station of Oregon during the year 1891 on the culture of sugar beets and the analysis thereof, and the results obtained are issued in Bulletin No. 17 of the Oregon Agricultural Experiment Station.

The standard varieties of sugar-beet seed were obtained and distributed to farmers in different parts of the State. A circular showing the best methods of cultivation was also sent out with the beets for the guidance of the farmers. Accompanying the report is a valuable contribution to the study of the climate and soil of the State in regard to the production of the sugar beet, and that portion of the State which is supposed to be most favorable to it is marked on a map. Tables showing the amount of rainfall in different parts of the State are also given. It is noticed that, in general, the spring rains lasted until quite late, thereby causing delay in the time of planting. Almost the whole of the planting was done in May, while in ordinary seasons a good portion of it could have been accomplished in April.

The number of samples analyzed was 95. The results are certainly encouraging and show that the sugar beet has great possibilities in the State. The report was prepared by G. W. Shaw, chemist, and Dumont Lotz, assistant chemist. In the conclusions which they draw from the analyses they state that the investigations have progressed far enough to indicate that there are sections in the State naturally adapted to the culture of the sugar beet, and these sections are noticed by shaded lines on the map. It is not suggested that the farmers should give up other crops to grow sugar beets, but that they should combine beet growing with the regular farm work.

An extended plan for experiments to be made in 1892 is also given.

The mean data from the analyses reported are as follows:

Average weight of beets in grams	*608.50
Per cent sucrose in juice	13.75
Purity coefficient	77.57

Pennsylvania.—Seven samples, showing an average content of 13.29 of sugar and an average weight of 22 ounces, were received. Five counties were represented. The highest result was obtained from Butler County, one sample showing 15.53 per cent of sugar and weighing 17 ounces. Lackawanna County, with two samples, showed a sugar content of 15.51 and an average weight of 18 ounces. The results from Pennsylvania are also of a most encouraging nature, although the number of samples is entirely too small to enter into a general comparison.

South Dakota.—Two hundred and two samples were received from the State of South Dakota, showing an average content of sugar of 12.45 and an average weight of 22 ounces. Forty-five counties furnished samples, of which Brown County furnished forty-nine, showing an average content of 12.76 of sugar and an average weight of 17 ounces. The county furnishing the next largest number of samples was Lake, from which twenty-nine samples were received, showing an average content of 11.04 of sugar and an average weight of 23 ounces. The richest

*Excluding one beet weighing 10 pounds.

beets received from South Dakota were from Faulk County. In general, the character of the beets from South Dakota is of a high order, the State showing remarkable facilities for producing beets of great saccharine strength.

Tennessee.—Five samples were received, showing an average content of 8.77 of sugar and an average weight of 20 ounces. The richest beet received from Tennessee was from Davidson County, and showed 14.82 per cent of sugar and weighed 11 ounces. The rest of the samples from that State were of a poor quality.

Texas.—Ten samples were received from the State of Texas, showing an average content of sugar of 10.31 and an average weight of 23 ounces. Samples were received from seven counties. The richest sample was received from Mason County, with a content of sugar of 13.92, but weighing only 5 ounces.

Virginia.—Seventy-two samples were received from the State of Virginia, of which 33 were from Augusta County and 29 from Frederick County. The average for the State is 11.12 per cent of sugar and 21 ounces the average weight. On the whole, the best results were obtained from Frederick County, with 29 samples showing 11.93 per cent of sugar in the beet and an average weight of 25 ounces. The average for Augusta County, with 33 samples, was 11.06 per cent of sugar in the beet and an average weight of 18 ounces.

Washington.—Eleven samples were received from the State of Washington, from six counties. The average content of sugar in the beets from the State was 14.47 and the average weight 18 ounces. The richest samples, two in number, were from Stevens County, showing an average of 17.51 per cent of sugar and averaging in weight only 10 ounces. The two samples from Whatcom County showed an average content of 15.70 of sugar and an average weight of 18 ounces. With the exception of two, Nos. 15263 and 15264, all the samples received from the State of Washington were of a high saccharine strength.

Wisconsin.—Four hundred and fifty-one samples were received from Wisconsin, representing sixty counties. The average content of sugar in the beets for the whole State was 11.05 and the weight of the beets 26 ounces. The richest beets were received from Ozaukee County, five samples showing an average of 13.42 per cent of sugar and averaging 17 ounces in weight. Jefferson County, with nineteen samples, showed an average content of sugar of 13.08 with an average weight of 24 ounces. One very poor sample is found in this county, viz, No. 15443. Marquette County furnished five samples with an average of 13.06 per cent of sugar and an average weight of 12 ounces. There is also one very poor sample from this county, viz, No. 15174. In general the results from Wisconsin are more reliable on account of the large number of samples which was sent. Where so many causes enter to disturb the accuracy of the data obtained, as is the case in experimental work of this kind, the greater the number of samples which can be obtained the greater the reliability of the results.

This experimental work in Wisconsin was supplemented also by an extensive series of experiments carried on by the Agricultural Experiment Station of the State, under the auspices of the Department of Agriculture. The following data give the results of these experiments:

SUGAR BEET EXPERIMENTS IN WISCONSIN IN 1891.

By F. W. Woll.

LETTER OF TRANSMITTAL.

MADISON, WIS., *February 8, 1892.*

DEAR SIR: I transmit herewith our report of beet-sugar investigations for this State during the season of 1891.

The report shows that we distributed a thousand pounds of seed among 850 farmers in the spring. In the fall 373 sample lots of beets were received at the station grown from the seed distributed in the spring. Had not a drought of almost unknown severity prevailed during the growing season, a much larger number of farmers would have sent in samples, as we received scores of letters from parties who had received seed, stating that they had been unable to grow any beets. The results of these analyses show 7.12 as the lowest per cent of sugar, highest 23.52, the average for the 373 samples being 12.56, with an average estimated yield of beets of over 15 tons to the acre.

At this station 2 acres of beets were grown, with every prospect in the spring of marked success, as the soil was well adapted to the roots and the stand of young plants remarkably even and uniform. The drought, however, cut the yield down to a little more than 14 tons for the 2 acres. Had there been a normal amount of rainfall, the yield would have been not less than 50 tons from the same plat.

Eleven varieties were planted in the station plat. The report shows the average per cent of sucrose in the beets grown by us to have been 15.5 per cent, with 13.27 per cent and 17.56 per cent as lowest and highest limit.

Much interest has been awakened in this State by the study of the sugar-beet plant carried on by this station under your direction, and I think it would be very unfortunate if the work were dropped at this time. While some other States have gone ahead faster than Wisconsin in the establishment ot beet-sugar factories, I believe we have really lost nothing in the apparent delay, for we are learning the capacity and possibilities of our soil and climate, and our farmers are gaining knowledge of the requirements essential to successful cultivation of the beet plant. We recollect the failure of two sugar-beet factories many years ago and are desirous of not repeating such results. This does not mean that the people are indifferent and lack confidence in this direction, but rather that they would move cautiously and be sure at each step of the ground occupied.

Trusting that this report may in some measure bear evidence that the confidence you have reposed in us was not misplaced, I am,

Very respectfully,

W. A. HENRY.

Hon. J. M. RUSK,
Secretary of Agriculture.

The report of the work done by this station during the year of 1891, in regard to the culture of sugar beets, will be discussed under two general headings: (1) Report of experiments at this station; and (2) report of analyses of beets from farmers in different parts of the State.

SUGAR BEETS AT THIS STATION IN 1891.

A piece of land of very nearly 2 acres was set apart in the spring for sugar beets. The plot slopes somewhat to the west, and is light clayey loam, becoming more sandy at the east end. As a consequence, the eastern portion is considerably drier and would suffer more in case of a drought, which also proved true during the past season, as the summer of 1891 was exceedingly dry. The meteorological data for this place for the months May–October, inclusive, are given in the following table. For the sake of comparison the total rainfall for the same months last year, and also the normal rainfall (average for two years) are given in the table.

*Meteorological data May to October, 1891, for Madison, Wis.**

RAINFALL IN INCHES.

Date.	Rainfall.	Date.	Rainfall.	Date.	Rainfall.	Date.	Rainfall.	Date.	Rainfall.	Date.	Rainfall.
	In.		*In.*		*In.*		*In.*		*In.*		*In.*
May 10	0.07	June 10	trace	July 2	0.47	Aug. 1	.18	Sept. 2	0.01	Oct. 6	0.11
15	trace	16	trace	6	.98	11	.16	6	trace	7	.04
21	.10	17	.012	7	.39	14	.03	12	trace	8	.03
22	1.00	18	.03	13	.03	20	.31	28	.37	13	.07
25	.25	19	.72	21	.02	21	.02			14	.03
31	.02	21	.04	22	.01	26	.28		.38	15	trace
		26	.04	23	.14	27	.15			17	.16
	1.44	27	.04	28	.62	29	.28	Oct. 3	0.65		
		28	1.58	29	.01	30	trace	4	.40		1.49
June 1	0.71	30	.01								
2	.02				2.67		1.41				
3	.33		3.69								
5	.09										
6	.06										

	May.	June.	July.	Aug.	Sept.	Oct.	Total.
Total rainfall, 1891	1.44	3.69	2.67	1.41	.38	1.49	11.02
Normal rainfall	3.54	4.42	4.19	3.28	3.35	2.87	21.65
Rainfall, 1890	5.03	7.72	1.81	4.23	2.62	4.59	25.00

* From Observations made at Washburn Observatory.

TEMPERATURE °F.

	May.	June.	July.	Aug.	Sept.	Oct
Maximum temperature	78.0	88.0	86.0	92.0	90.0	83.0
Minimum	32.0	44.0	48.0	46.0	35.0	19.0
Mean	56.0	67.2	66.6	68.4	67.0	45.4
Mean normal	57.8	67.2	72.7	69.4	61.0	48.5

It will be noticed that the precipitation for 1891 for the summer months was only 11.02 inches, or about half of normal and less than half of last year's, during the same months. Up to July 7 the prospects for a large yield were most promising. Between July 7 and August 26 there was not more than one good rain, and as a result the beets suffered greatly from the drought from this time on. August, September, and October all being very dry, the growth of the beets was checked, and a small yield of beets, to some extent abnormally rich in sugar, was the result. May, July, August, and October were colder than the normal, while September was considerably warmer. With a proper supply of moisture there is, however, little doubt but what a good crop of beets would have been harvested.

VARIETIES PLANTED.

The following eleven varieties were planted on May 26 and 27: Le Maire's Richest, Simon LeGrande, Vilmorin, Kleinwanzleben, Bulteau Desprez, Desprez B. & R., La Plus Riche, F. Kroemer, O. B. S. & Co., French, German. The first nine varieties were obtained from Oxhard Beet Sugar Co., Grand Island, Nebr., and the two last varieties from the United States Sugar Experiment Station at Schuyler, Nebr. In all, 183 rows were planted. The length of each row was 190.6 feet, and the distance between each row 30 inches; the seed was planted thicker than last year; after last thinning the beets stood 4 to 6 inches apart in the rows. From 14 to 22 rows were planted of each variety, these being planted in the order given above, starting from the west end of the plot. The plot was cultivated on June 10 and 11 with wheel hoe, June 15 with narrow tooth single cultivator, June 22 to 26 the plants were thinned and hoed and a horse cultivator run through the rows. At this time the plants were about 3 inches high. The horse cultivator was run through the rows again on July 2, 14, 31, and the weeds in the rows were destroyed by hand hoeing July 20 to 23 and August 1. The harvesting was done by plowing a furrow close up to the beets; after thus laying them bare they were easily pulled and thrown in a pile. After all beets were thrown in piles they were topped and drawn by team to the farm root-cellar, after having first been weighed. A basketful of each load was taken out to be washed and the per cent of dirt adhering to the beets thus obtained.

The following gives the time spent in growing the crop of beets, and also the cost, estimating the wages for a man 10 cents an hour, for man and horse 15 cents, and man and team 25 cents per hour:

Cost of growing a crop of beets from a 2-acre field.

Plowing and preparing the land (allowed)	$2.00
Planting and cultivating the crop:	
304 hours' time for one man	30.40
22 hours, man and horse	3.30
Harvesting and hauling the crop:	
111 hours' time for one man	11.10
28 hours for man and team	7.00
Total	53.80

From this field we obtained a little more than 14 tons of washed beets (as we shall see presently), which would make the total cost of growing and harvesting a ton of beets $3.76, allowing the tops, which yielded more than 4 tons from the plat, to pay for rent of land, the cost of seed, and wear of machinery. Last year our beets yielded more than 20 tons per acre on an average. This yield may be considered slightly above average for good land and cultivator; but if we take 15 tons as an average yield per acre we get the cost of raising and harvesting 1 ton of sugar beets $2.46, assuming the cost of harvesting and hauling the beets double the amount charged in the above table. The average price per ton of beets during the past season was, in Nebraska, $3.50, in California $4, in Utah $4.50. With the average price of $4 paid for the beets the net income from one acre would be $23. Doubtless the cost of growing the crop could be considerably reduced by growing the beets on a larger scale, and by the application of machinery that will successfully pull the weeds in the rows between the beets. On the other hand, the cost of hauling the beets would be larger with a greater distance to the factory—an item that would easily swallow up all profit if the distance is too great.

EXAMINATION OF BEETS GROWN AT UNIVERSITY FARM.

The beets were sampled and analyzed September 26, 1891, and also at harvesting time, October 26. Three beets were selected for analysis, washed and dried, a quarter section of each beet cut and grated together, the pulp put in a bag, and the

juice pressed out. The specific gravity of this was then observed, and the clarified juice polarized. At harvesting time two or three different samples of each variety were taken, and the results averaged. The sugar in the beets was determined in these samples by the alcohol method of Tollens-Rapp-Degener (Koenig, Unters. landw. wicht. Stoffe, 1891, p. 436). The results of the analyses are given in the following table:

Sugar beet season, 1891.

SAMPLES TAKEN SEPTEMBER 26.

Name of variety.	Average weight of beets.	Solids in juice.	Sugar in juice.	Purity coefficient.	Sugar in the beets.
	Pounds.	*Per cent.*	*Per cent.*		*Per cent.*
Le Maire's Richest	1.32	19.05	15.71	82.5	....
Simon LeGrande	.88	19.64	16.45	83.8	....
Vilmorin	.77	20.54	17.26	84.2	....
Kleinwanzlebener	.62	21.82	18.75	85.0	....
Bulteau Desprez	.82	22.62	19.47	86.1	....
Desprez	.50	21.05	17.67	84.00	....
La Plus Riche	.75	22.40	19.37	86.6	....
E. Kroemer	.55	23.00	19.44	84.5	....
O. B. S. & Co	.48	22.40	18.38	82.0	....
French	.43	23.05	28.43	88.6	....
German	.55	24.15	20.59	85.3	....

SAMPLES TAKEN AT HARVESTING TIME, OCTOBER 26.

Name of variety.	Average weight of beets.	Solids in juice.	Sugar in juice.	Purity coefficient.	Sugar in the beets.
Le Maire's Richest	1.28	19.72	16.97	86.1	14.54
Simon LeGrande	1.08	18.52	14.99	81.0	13.27
Vilmorin	.71	21.07	17.95	85.2	15.63
Kleinwanzlebener	.69	21.77	18.78	86.3	15.70
Bulteau Desprez	.61	20.69	16.84	81.4	15.67
Desprez	.73	21.38	17.28	80.8	14.87
La Plus Riche	.57	22.23	18.24	82.0	15.50
F. Kroemer	.49	22.79	19.35	84.9	15.99
O. B. S. & Co	.53	22.25	17.81	80.0	15.61
French	.70	21.25	17.37	81.7	16.17
German	.37	23.86	20.53	86.1	17.56
Average of analyses, October 26	.71	21.41	17.83	83.3	15.50

The analyses of the samples taken September 26 agree as well as could be expected with those of the samples taken at harvesting time. The latter samples were taken from the harvested beets when a good idea could be obtained of the average size of each variety. It may be said, in general, that the quality of the beets did not improve after September 26, and it is not likely that the yield was increased perceptibly during the month of October, owing to the extreme dryness of the soil. The beets were very small, averaging only about 11 ounces for all the varieties. The average per cent of sugar (sucrose) in the juice at harvesting time was 17.83 per cent, ranging from 14.99 to 20.53 per cent. The average sucrose in the beets was 15.50 per cent, with 13.27 per cent and 17.56 per cent as lowest and highest limit. By dividing 15.50 by 17.83 we find that the beets contained 86.9 per cent of juice on an average, showing that the dry season produced beets with unnaturally high sugar content and with a low percentage of juice.

It will be noticed that the percentages of sugar increase as we go down in the table—that is, with the beets growing farther east on the plot. We saw that the soil was drier and perhaps also poorer in the eastern part of the field than in the western, and the beets were smaller in size and richer in sugar the farther east we go in the field. As a rule, size and sugar content of the beets stand in inverse ratio to one another.

YIELD OF BEETS.

The following table will give the necessary data with reference to yield of beets and of tops from the plat and the estimated yield of beets and of sugar per acre:

Yield of beets and of tops.

No. of rows.	Name of variety.	Beets from plot.	Tops from plat.	Dirt on beets.	Washed beets per acre.	Sugar per acre.
		Pounds.	*Pounds.*	*Per cent.*	*Pounds.*	*Pounds.*
22	Le Maire's Richest	4,828	1,570	8.1	17,651	2,566
18	Simon LeGrande	4,204	1,334	4.4	10,473	1,390
16	Vilmorin	2,994	654	9.7	15,494	2,421
14	Kleinwanzlebener	2,804	1,008	13.1	15,960	2,506
14	Bulteau Desprez	2,624	772	14.7	14,662	2,298
20	Desprez	3,534	768	8.9	14,758	2,195
18	La Plus Riche	2,780	632	13.3	12,280	1,903
16	F. Kroemer	2,188	504	12.5	10,973	1,755
16	O. B. S. & Co	2,355	568	12.4	11,745	1,833
14	French	1,945	466	12.4	12,284	1,986
15	German	1,701	460	14.8	8,860	1,555
	Total from plat, 1.945 acres	31,957	8,736			
	Average per acre				14,677	2,267

The beets yielded a little more than 7 tons to the acre and a little more than 1 ton of sugar to the acre. Last year under favorable conditions of weather the yield was 15 to 26 tons per acre, with an estimated yield of 2 to 3½ tons of sugar per acre. Owing to the extreme drought, the like of which according to the testimony of many old settlers has not been seen for a generation with us, the beets yielded less than a half crop. The yield of 7 tons to the acre may therefore be considered the very lowest returns which will be obtained where good cultivation and care are bestowed on the beets with us.

No comparison can be made between the different varieties as regards quality or yield, the difference between the different parts of the field being greater than that between the different varieties. The varieties being under the most favorable conditions (on the lowest ground, which contained most moisture) gave the largest yields per acre of both beets and sugar.

BEETS FROM FARMERS IN DIFFERENT PARTS OF THE STATE.

One thousand pounds of imported white imperial sugar-beet seed was bought by the station last spring from the Menomonee Falls Sugar Company, and distributed in pound packages to 851 farmers, requesting them to keep notes as to the growth and cultivation of the beets and to forward samples of the beets grown for analysis to this station in the fall. Owing to the drought, the beets did not do well with a large number of farmers, and many paid but little attention to them as a consequence; in all, 373 samples of beets were received and analyzed by the writer. Twenty samples were forwarded by mistake to the U. S. Department of Agriculture in Washington, D. C., and analyzed by their chemists. Of the farmers receiving sugar-beet seed from us, 33 reported failure of the crop, and four wrote they did not plant the seed. The samples analyzed were all from the White Imperial seed sent out, except where otherwise stated. The 373 samples came from fifty-nine counties in the State, making only nine counties that were not represented.

Most portions of the State suffered greatly from the drought, although not all as much as the central part. The following table will give an idea of the distribution of rain during the summer months at 17 weather-service stations in different parts of the State. The table is condensed from data furnished by Mr. W. L. Moore, forecast official, Milwaukee, Wis., to whom credit is due for the favor.

Rainfall May to October, inclusive, 1891, in inches.

Name of station.	County.	May.	June.	July.	Aug.	Sept.	Oct.	Total.	Normal precipitation.
Prairie du Chien	Crawford	1.65	2.95	1.76	2.32	1.73	1.82	12.23	....
Madison	Dane	1.42	3.68	2.64	1.41	.38	1.49	11.02	21.7
Eau Claire	Eau Claire	2.00	5.40	2.20	1.70	1.70	3.10	15.47	....
Fond du Lac	Fond du Lac	.44	2.73	2.94	2.17	.58	1.63	10.49	....
Watertown	Jefferson	1.83	......	2.25	1.47	.48	2.06	*8.09	....
Kenosha	Kenosha	1.52	4.27	3.67	1.62	.72	......	*11.80	....
Lincoln	Kewaunee	.83	3.12	1.85	3.62	1.42	......	*10.84	....
La Crosse	La Crosse	.69	5.62	2.92	1.48	1.77	1.87	14.35	23.1
Manitowoc	Manitowoc	.29	3.73	2.16	2.42	.76	1.70	11.06	19.7
Milwaukee	Milwaukee	1.47	4.98	3.57	2.83	.18	1.66	14.69	19.8
Appleton	Outagamie	.01	5.20	5.20	1.45	.69	1.43	13.98	....
Janesville	Rock	.21	5.19	3.22	......	.18	2.35	*11.15	....
Hammond	St. Croix	1.19	7.61	2.73	2.20	1.48	1.98	17.19	....
Shawano	Shawano	.11	2.95	1.70	2.79	1.13	1.23	9.91	....
Medford	Taylor	.46	3.54	2.27	2.08	2.60	3.20	14.15	....
Hillsboro	Vernon	.70	3.47	2.99	1.36	1.04	2.03	11.59	....
Centralia	Wood	.37	3.46	2.85	3.48	2.28	1.52	13.96	....

* Total for four months.

We give here the results of the analysis of sugar beets made by the U. S. Department in Washington. The beets were forwarded during the first days of October and must have been harvested between September 15 and 25.

Analyses of sugar beets grown in Wisconsin, 1891. Analyses made by U. S. Department of Agriculture, Washington, D. C.

Serial No.	Name.	Post-office.	County.	Average weight of beets.	Sugar in juice.	Sugar in beets.	Purity*	Variety.
				Ounces.	*Pr. ct.*	*Pr. ct.*	*Coefficient.*	
15258	Aug. Kreamer	Green Bay	Brown	33⅓	9.44	8.97	83.5	Imperial.
15207	E. T. Mixdorf	Dorchester	Clark	12⅓	12.88	12.22	74.9	Kleinwanzleben.
15208	....do	....do	....do	12	15.42	14.65	83.1	Do.
15201	John Michler	Doylestown	Columbia	17⅔	8.15	7.65	61.7	Do.
15260	Wm. Kube	Richwood	Dodge	21⅓	8.78	8.27	69.6	Imperial.
15230	Jos. Zeller	Calumetville	Fond du Lac	30⅓	11.34	10.77	77.7	Do.
15269	A. Langmore	Montfort	Grant	15	12.61	11.98	80.0	Do.
15206	R. R. Roberts	Monroe	Green	14⅔	12.59	11.96	77.3	French.
15209	Henry Osborn	Brooklyn	....do	16	11.61	11.02	76.0	Kleinwanzleben.
15202	J. C. Loomis	Alma Center	Jackson	32⅔	11.32	10.75	76.6	Do.
15271	Jacob Reth	Ahnapee	Kewaunee	6⅓	13.26	12.60	77.5	German.
15173	L. Vaughan	Unity	Marathon	10⅓	15.65	14.87	82.4	Kleinwanzleben.
15174	Z. G. Taylor	Packwaukee	Marquette	20	10.20	9.69	65.0	Do.
15225	W. E. Volk	Oconto Falls	Oconto	21⅔	13.37	12.76	78.6	Do.
15257	G. F. Wieseman	Olivet	Pierce	19	11.29	10.72	72.0	Imperial.
15169	A. Austin	Janesville	Rock	60⅔	9.17	8.71	70.1	Do.
15211	E. Hubbell	....do	....do	14⅓	12.89	12.29	72.9	Do.
15253	Thos. Matchie	Elk Creek	Trempealeau	34⅔	7.38	7.10	65.3	Do.
15226	M. J. Warner	....do	....do	16⅓	12.24	11.62	77.3	Do.
15213	Jno. E. Hughes	Wales	Waukesha	31⅜	10.58	10.05	71.1	Do.
				22¼	11.51	10.93	......	

* *i. e.*, the ratio of sugar to the other solids in the juice of the beet.

As will be noticed, nearly all the analyses come very low, only two samples analyzing above 15 per cent of sugar in the juice, and only nine out of twenty above 12 per cent. Doubtless the early date at which the beets were harvested will largely explain their inferior

quality. No further data are on hand as regards soil, period of growth, or yield of beets from an acre of land.

We shall now give the analyses of samples of sugar beets made at this station during the past fall, along with such additional information as to the culture of the beets as it has been possible to gather. The analyses are arranged alphabetically according to counties and according to post-offices within each county. The data for each county are averaged so as to give the average size of the samples received from each county, the yields of beets, solids and sugar in the juice, and the purity coefficients.

Sugar beets in Wisconsin, season of 1891, arranged alphabetically according to counties.

No.	Name of grower.	Post-office.	County.	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Yield per acre.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
							Pounds.	*Pounds.*	*Per cent.*	*Per cent.*		
1	Ole Olson	Arkdale	Adams	May 20	Oct. 10	Sandy loam	1.27	....	15.05	11.32	75.2	Unmanured.
2	N. Barnes	Easton	do	May 8	Nov. 1	do	1.33	10,540	17.22	13.86	80.5	Barnyard manure.
3	C. R. Sickles	Plainville	do	May 14	Oct. 9	do	1.78	26,560	14.58	10.79	74.0	Horse manure.
	Average						1.46	18,550	15.62	11.99	76.1	
4	A. Gulickson	Cameron	Barron	Apr. 30	Oct. 16	Sandy loam	.83	....	16.15	12.87	78.1	Barnyard manure,
5	G. O. Wall	Dallas	do	May 25	Oct. 24	Clayey soil	1.25	57,610	18.32	14.17	77.3	Unmanured.
6	M. A. Gates	Sprague	do	May 7	Oct. 15	Clay	1.63	13,130	15.15	11.18	73.7	Do.
	Average						1.24	35,370	16.54	12.74	77	
7	F. Zimmerman	Green Bay	Brown	May 15	Oct. 15	Sandy	3.68	21,780	13.55	9.74	71.9	Do.
8	W. Thelen	do	do	June 1	Oct. 10	Black sand	.92	49,985	16.36	13.24	80.9	
9	Jacob Hein	Greenleaf	do	Apr. 20	Oct. 10	Clayey	2.45	....	15.58	12.01	77.1	
10	J. E. Duaime	West De Pere	do	May 19	Oct. 8	Sandy loam	2.15	....	11.88	7.99	67.2	
	Average						2.30	35,883	14.34	10.75	74.9	
11	P. F. Mueller	Fountain City	Buffalo				*1.30	....	22.42	16.68	74.4	
12	J. B. Meyer	Modena	do	Apr. —	Oct. 12	Sandy loam	1.07	40,000	16.50	13.30	80.7	Do.
13	do	do	do	Apr. —	Oct. 12	do	†.82	....	16.95	14.54	85.8	Do.
14	Alfred Day	Mondovi	do	May 27	Oct. 29	Sandy	.57	....	19.18	16.40	85.5	Do.
15	Geo. Hess	Montana	do	May 27	Oct. 10–20	Black mold	1.95	32,000	16.78	11.42	68.0	Horse manure.
16	Jacob Angst	Waumandee	do	May 5	Oct. 12	Sandy	1.15	23,410	14.58	9.60	65.9	Stable manure.
	Average						1.14	31,803	17.74	13.66	77.0	
17	G. Abitz	Brillion	Calumet	May 25	Oct. 15	Red clay	.88	....	14.38	10.09	70.2	Horse manure.
18	Aug. A. Paulsen	New Holstein	do	May 15	Nov. 1	Heavy clay	.65	20,040	19.22	15.92	82.8	Unmanured.
	Average						.77	20,040	16.80	13.00	77.7	
19	Joseph Ruff	Bloomer	Chippewa	May 20	Oct. 17	Sandy	2.18	24,390	13.60	10.29	75.7	Horse manure.
20	A. B. Peterson	do	do	May 26	Oct. 20	Sandy loam	2.73	10,800	16.34	11.73	71.8	Unmanured.
21	A. Bischel	do	do	May 15	Oct. 9	do	3.52	10,800	14.88	10.62	71.4	Stable manure.
22	P. Bodem	Boyd	do	May 30	Oct. 25	Black soil	3.45	....	16.05	11.91	74.2	Do.
23	J. W. Thomas	Chippewa Falls	do	May 2	Oct. 12	Sandy loam	2.23	96,270	14.58	11.23	77.0	5 bushels ashes per acre.
24	do	do	do	May 2	Oct. 12	do	2.60	117,610	14.82	10.97	74.0	10 tons cow manure per acre.

* Kleinwanzlebener. Seed from U. S. Department of Agriculture.

† Beets considerably wilted.

Sugar beets in Wisconsin, season of 1891, arranged alphabetically according to counties—Continued.

No.	Name of grower.	Post-office.	County.	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Yield per acre.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
							Pounds.	*Pounds.*	*Per cent.*	*Per cent.*		
25	M. Sarrasin	Chippewa Falls	Chippewa	May 13	Oct. 8	Sandy	3.10	....	13.82	9.93	71.8	Unmanured.
26	Ph. Rheingaus	do	do	May 6	Oct. 17	Sandy loam	4.08	....	15.68	11.77	75.0	Hog manure.
	Average						2.99	15,330	14.97	11.06	73.2	
27	F. Mueller	Curtiss	Clark	May 10	Oct. 10	Sandy clay	1.07	6,000	16.82	14.02	83.3	Stock manure.
28	F. W. Kalepp	Dorchester	do	May 13	Oct. 15	Black humus	1.20	....	17.45	13.20	75.7	Do.
29	Matt. Wells	Neillsville	do	May 23	Oct. 10	Sandy loam	1.93	32,670	15.05	12.34	82.0	Unmanured.
30	L. Randall	do	do	May 21	Oct. 12	Loam	1.45	31,120	17.35	14.31	82.5	Do.
31	C. G. Gorsigner	Sterling	do	May 7	Sept. 23	Sandy clay	1.78	....	14.58	10.79	74.0	Do.
	Average						1.49	41,263	16.25	12.93	79.5	
32	R. J. Karow	Columbus	Columbia	....	Nov. 5	Clay	4.20	....	*17.40	11.89	68.3	Barnyard manure.
33	Th. Anderson	Doylestown	do	May 20	Oct. 20	Black soil	.70	1,920	*17.22	11.27	65.4	Unmanured.
34	J. H. Randall	Fall River	do	May 10	Oct. 16	Sandy	2.78	12,000	15.90	10.97	69.0	Do.
35	R. Hopkins	Leeds	do	May 11	Oct. 11	Prairie	2.17	....	15.85	12.27	77.4	Barnyard manure.
36	Ch. Schlee	Portage	do	May 14	Oct. 16	Sandy	.83	10,800	†20.14	15.70	78.0	
37	J. L. Curtis	Poynette	do	June 5	Oct. 9	Clay	2.17	....	14.70	11.70	79.3	
	Average						2.14	8,240	16.89	12.30	72.8	
38	A. Snatek	Eastman	Crawford	May 21	Oct. 13	Red clay	8.02	44,800	11.75	7.61	64.7	Hog manure.
39	C. C. Pickett	Hurlburt	do	June 1	Oct. 13	Black loam	2.92	....	13.18	8.81	66.9	
40	H. Wachter	Prairie du Chien	do	May 20	Oct. 15	Sandy loam	4.33	28,800	12.95	9.88	76.3	Unmanured.
41	G. J. Schoeffer	do	do	May 9	Sept. 20	Clay	1.78	18,000	18.14	14.07	77.6	Do.
	Average						4.26	30,533	14.01	10.09	72.0	
42	L. A. Halvorson	Adsit	Dane	May 17	Oct. 12	Light clay	1.65	21,340	18.12	12.90	71.2	Do.
43	C. G. Johnson	Brooklyn	do	May 15	Oct. 20	Black soil	1.83	10,000	†23.26	19.83	85.2	Barnyard manure.
44	J. C. Cannon	Hanerville	do	May 15	Oct. 12	Sandy	2.11	43,630	15.40	11.98	77.7	Stock manure.
45	E. Evans	McFarland	do	May 23	Oct. 1	Black loam	.57	....	17.45	14.56	83.3	Unmanured.
46	R. Williamson	Madison	do	May 10	Oct. 7	Clay	2.02	28,0 0	15.18	11.26	74.2	Do.
47	W. H. Paulli	do	do	May 12	Oct. 15	Black loam	.93	26,400	20.84	15.95	76.5	Do.
48	J. Sachtjen	do	do	May 30	Oct. 23	Clay	1.90	19,200	18.28	14.52	79.4	Horse manure.
49	H. Stopplewerth	do	do	May 16	Nov. 5	Heavy clay	4.30	30,000	16.78	13.48	80.3	
50	W. J. Radke	Marshall	do	May 3	Nov. 3	Black soil	1.30	....	17.18	12.45	72.4	
51	L. Lawrence	Middleton	do	June 3	Oct. 20	Sandy loam	1.27	63,400	16.16	10.99	69.6	Unmanured.
52	J. R. Hinterson	Riley	do	May 24	Oct. 10	Clay	1.18	....	17.01	13.64	80.2	

53	E. A. Wright	Stoughton	Chippewa	May 19	Oct. 5	Clay loam	1.93	17,280	17.45	13.71	78.6	Do.
	Average						1.75	28,805	17.76	13.77	77.5	
54	J. C. Lieske	Clyman	Dodge	May 26	Oct. 13	Black soil	.63	9,800	17.0	14.64	86.2	Do.
55	J. Woodbran	Fox Lake	do		Oct. 13	Clay	5.13		14.0	10.11	72.2	Do.
56	Ch. Discher	Horicon	do	May 25	Oct. 16	do	4.43	49,600	13.78	9.50	68.9	Do.
57	A. C. Becker	Juneau	do	May 22	Oct. 12	do	2.00		16.90	12.99	76.9	Cow manure.
58	F. Holz	Kekoskee	do	May 12	Oct. 23	Sandy loam	4.05	71,438	16.52	11.93	72.3	Horse manure.
59	E. G. Breselow	Knowles	do	Apr. 20	Oct. 17	Black loam	3.27	53,806	14.48	10.82	74.7	Do.
60	A. O. Cubs	Mayville	do	May 15	Oct. 19	do	2.10		16.60	12.93	77.9	Unmanured.
61	L. Somerfeld	Oak Grove	do	May 15	Oct. 14	Black	1.62	35,000	14.25	9.94	69.8	Barnyard manure.
62	T. Wedemeyer	Richwood	do	May 17	Oct. 22	Clay loam	1.13	24,000	19.30	16.23	84.1	Unmanured.
63	Geo. Rekland	Theresa	do	May 13	Oct. 9	Yellow clay	2.22		16.16	11.88	73.5	Stock manure.
	Average						2.66	41,441	15.90	12.10	76.2	
64	A. J. Eichinger	Stevensons Pier	Door	May 4	Oct. 15	Sandy loam	.75	29,620	17.17	14.14	76.9	Barnyard manure.
65	E. Birmingham	Sturgeon Bay	do	June 13	Oct. 14	Black sand	1.78	26,140	19.05	15.14	79.5	Horse manure.
66	L. R. Stephenson	do	do	May 20	Oct. 24	Sandy	2.52	75,359	17.70	14.50	81.9	Barnyard manure.
	Average						1.67	42,780	18.24	14.59	80.0	
67	S. Rudesill	Downing	Dunn	May 30	Oct. 8	Clay loam	2.17	16,730	14.70	11.68	79.5	Unmanured.
68	W. Suser	do	do	May 15	Nov. 1–3	Black bottom	2.28	8,400	15.40	11.53	74.9	Do.
69	J. W. Atkinson	Downsville	do	May 25	Oct. 14	Heavy timber	1.77		15.25	11.92	78.2	Do.
70	R. Cunningham	do	do	May 23	Nov. 2	Black soil	1.38		16.72	12.71	76.0	Do.
71	M. McDonald	Elk Mound	do	May 15	Oct. 25	Loam	2.82	120,640	17.46	13.55	77.6	Horse manure.
72	Thos. Darling	Knapp	do	May 20	Oct. 8	Clay loam	2.97	57,100	12.95	9.77	75.5	Unmanured.
73	John Reinecke	Menomonie	do	May 16	Oct. 9	Sandy loam	3.58	27,920	17.60	14.57	82.8	
74	Wm. Moedy	do	do	May 21	Oct. 19	Clay loam	1.88		16.36	12.35	75.5	
75	Wm. Miller	Rusk	do	May 20	Oct. 19	Clay loam	2.87	15,680	15.85	11.65	73.5	Do.
	Average						2.41	25,766	15.81	12.19	77.1	
76	C. Bernicke	Altoona	Eau Claire	Apr. 20	Oct. 1	Sandy	2.15	3,200	14.90	11.91	79.9	Hog manure.
77	R. Schilling	do	do				1.97		14.20	11.60	81.5	
78	D. M. Sherman	Eau Claire	do	May 21	Oct. 13	Sandy loam	2.85		15.85	12.41	78.3	Unmanured.
79	R. J. Kepler	do	do	May 20	Oct. 6	do	2.02	38,400	15.68	11.66	74.4	Do.
80	A. J. Cheesebro	do	do	May 28	Oct. 10	do	1.48	31,100	15.45	12.34	79.9	Do.
81	G. W. Huefkin	do	do	May 20	Oct. 19	do	1.70		15.75	11.52	73.1	Horse manure.
82	F. Mueller	Fall Creek	do	May 10	Oct. 1	Sandy	1.33	48,000	15.40	12.51	81.2	Stable manure.
83	John Nix	Nixcorner	do	May 11	Oct. 8	Sandy loam	.43	19,200	16.15	12.12	75.1	Barnyard manure.
84	S. E. Coon	Otter Creek	do	June 2	Nov. 1	Sandy clay	1.05		17.58	12.98	73.8	
	Average						1.66	27,980	15.66	12.12	77.4	
85	G. Stelter	Fair Water	Fond du Lac	May 23	Oct. 15	Burr oak soil	2.48	19,520	13.08	8.87	67.8	Unmanured.
86	P. C. Jacobs	Kirkwood	do	May 10	Oct. 21	Black soil	2.75	18,000	17.90	14.71	82.2	
87	Peter Korb	Marytown	do	June 5	Oct. 17	do	3.12		13.50	9.61	71.2	

* Beets somewhat wilted.

† Beets considerably wilted.

Sugar beets in Wisconsin, season of 1891, arranged alphabetically according to counties—Continued.

No.	Name of grower.	Post-office.	County.	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Yield per acre.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
							Pounds.	*Pounds.*	*Per cent.*	*Per cent.*		
88	H. L. Clapp	Ripon	Fond du Lac	May 20	Oct. 20	Black prairie	1.08	21,440	18.42	13.82	75.0	Sheep manure.
89	J. Cronk	Waupun	do	May 7	Nov. 1	do	2.68	12,000	15.62	10.45	66.9	Barnyard manure.
	Average						2.42	17,740	15.70	11.40	73.2	
90	John Masbaum	Crandon	Forrest	May 15	Oct. 10	Sandy loam	1.85	12,000	13.30	9.64	72.5	Do.
91	John Harris	Bagley	Grant	May 24	Oct. 15	do	3.42		15.86	10.90	68.7	
92	J. Baumgartner	Fennimore	do	May 23	Oct. 10	Clay	2.72	26,400	15.0	11.28	75.2	Unmanured.
93	R. H. Davidson	Mount Hope	do	May 10	Oct. 14	Bottom & clay	3.07		14.35	10.13	70.6	Barnyard manure.
94	J. H. Wise	Platteville	do	June 9	Oct. 16	Prairie loam	1.62		17.92	12.35	68.8	Unmanured.
95	do	do	do	June 1	Oct. 17	Timber soil	1.48		18.14	13.46	74.2	Barnyard manure.
	Average						2.46	26,400	16.25	11.62	71.5	
96	John Elmer	Browntown	Green	May 12	Oct. 17	Rich soil	1.28		17.70	13.91	78.6	Unmanured.
97	Thos. Sears	Monticello	do	May 10	Oct. 30	Loam	1.55	37,670	17.92	14.58	81.9	Do.
	Average						1.43	37,670	17.81	14.30	80.3	
98	H. G. Bahr	Berlin	Green Lake	May 25	Oct. 18	Sandy	2.55		14.48	11.31	78.1	Do.
99	M. Treseder	Ridgeway	Iowa	May 10	Oct. 7	Clay	3.63		14.88	10.83	72.8	Do.
100	Thos. Conwey	do	do	May 30	Oct. 20	Prairie loam	2.83	41,380	14.30	9.80	68.6	Do.
101	D. L. Rogers	Wyoming	do	June 6	Oct. 10	Sandy loam	2.75	69,696	13.30	9.60	72.1	Barnyard manure.
	Average						3.07	55,538	14.16	10.08	71.2	
102	H. Overby	Sechlerville	Jackson	May 26	Oct. 15	Bottom land	4.12		11.88	7.79	65.6	Unmanured.
103	Chas. Jaquith	Oak Hill	Jefferson	May 21	Oct. 26	Clay	.88	69,160	18.75	15.95	85.1	Do.
104	L. M. Krippner	Oakland	do	May 30	Oct. 15	Heavy clay	1.42	10,560	18.10	14.13	78.0	Hog manure.
105	Ph. Jaquith	Palmyra	do	May 12	Oct. 13	Black sand	1.82		12.08	8.33	68.9	Barnyard manure.
106	J. Schoechert	Watertown	do	May 15	Sept. 21	Sandy clay	*.65	40,000	26.10	23.52	90.1	Unmanured.
107	F. Hartwig	do	do	May 25	Sept. 22	Clay	1.10	35,840	21.15	16.88	79.8	
108	J. Brockmann	do	do				1.85		18.38	14.24	77.5	
109	J. Rafferty	do	do	May 4	Oct. 9	Black soil	.97		17.45	14.43	82.7	Stock manure.
110	A. Krueger	do	do	May 15	Oct. 16	Red clay	1.58	22,400	17.50	14.02	80.1	Unmanured.
111	B. Boelle	do	do	May 1	Oct. 15	Black soil	1.40		17.30	14.12	81.6	Cow manure.
112	C. Dippel	do	do	May 15	Oct. 15	Clay	.80		18.10	12.95	71.6	
113	T. Loeffler	do	do	June 5	Oct. 19	do	1.75		19.02	14.97	78.7	Horse manure.
114	D. Hildermann	do	do	May 10	Oct. 14	do	1.23	12,000	17.96	14.68	81.7	
	Average						1.29	27,137	18.49	14.85	78.2	

115	Jas. Mutch	Elroy	Juneau	May 24	Oct. 23	Prairie soil	2.25	24,000	16.0	12.07	75.4	Unmanured.
116	F. Prevez	....do	....do	May 12	Oct. 24	Clay	2.02	†36,800	17.70	12.78	72.2	Vilmorin seed from U. S. Department of Agriculture.
117	A. Pazik	Lyndon	....do	May 16	Oct. 16	Sandy	1.33	....	19.16	14.94	78.0	
118	N. M. Eess	New Lisbon	....do	May 18	Oct. 15	....do	3.08	86,420	16.90	12.54	74.2	Cow manure.
119	A. M. Smith	....do	....do	May 20	Oct. 17	....do	2.65	....	16.90	13.02	77.0	
120	E. Cook	....do	....do	June 10	Oct. 20	....do	2.53	53,330	16.36	12.89	78.8	Barnyard manure.
	Average						2.31	50,638	17.17	13.04	76.0	
121	G. H. Kroencke	Wilmot	Kenosha	May 11	Oct. 12	Black loam	2.68	43,500	16.28	12.71	78.1	Cow manure.
122	W. B. Ray	Alaska	Kewaunee	May 8	Oct. 19	Loam	1.37	26,240	17.92	13.67	76.3	Barnyard manure.
123	F. Werth	Carlton	....do	May 23	Oct. 20	Clay	3.30	....	18.14	13.24	73.2	Unmanured.
124	K. Galenburger	Kewaunee	....do	May 25	Oct. 22	Clay loam	2.40	....	16.28	11.91	73.1	Seed from Nebraska.
125	J. Moratek	....do	....do	May 31	Oct. 16	Clay	3.93	....	12.10	7.27	60.5	French seed from Washington, D. C.
126	John Jellineck	....do	....do	May 12	Oct. 20	....do	1.88	....	19.00	15.88	83.6	
127	Chr. Trakeli	....do	....do	June 20	Oct. 16	....do	2.63	....	16.42	12.72	77.5	Seed from Washington, D. C.
128	F. Bassardick	....do	....do	May 5	Oct. 22	Rich clay	1.65	....	16.32	12.22	74.9	Seed from Nebraska.
129	Chr. Boettcher	....do	....do	May 14	Oct. 20	Clay	1.88	....	20.44	15.68	76.7	Seed from Washington, D. C.
130	H. Reirdance	....do	....do	May 20	Oct. 3	Clay loam	3.00	....	14.75	9.59	65.0	*Manured in fall.
131	Ant. Galenberger	....do	....do	May 28	Oct. 29	Sandy	2.28	....	17.32	13.43	74.0	Do.
132	Aug. Rogenbaur	Krok	....do	May 22	Oct. 20	Loam	1.42	....	16.10	12.01	74.6	Seed from Washington, D. C.
133	H. Strahls	Norman	....do	June 3	Oct. 15	Sandy	1.27	....	17.70	13.24	74.8	Manured.
	Average						2.25	26,240	16.87	12.49	74.0	
134	W. F. Moeser	Lacrosse	Lacrosse	May 10	Oct. 9	Black loam	1.65	14,080	14.88	12.13	81.5	
135	H. Bonsack	....do	....do	May 16	Oct. 12	Sandy loam	1.55	15,936	15.62	12.36	79.1	Horse manure.
136	Louis Wolff	....do	....do	May 10	Oct. 15	Black loam	3.35	....	13.42	9.62	71.7	
137	J. E. Lepke	....do	....do	June 3	Oct. 20	Clay	2.00	30,000	17.92	13.74	76.7	Unmanured.
138	John Dawson	....do	....do	May 1	Oct. 26	Clay loam	2.27	....	16.92	13.20	77.9	
139	F. Wriensch	....do	....do	June 11	Oct. 22	Sandy loam	‡.71	....	27.85	23.25	83.5	
140	Frank Wolff	....do	....do	May 10	Oct. 14	....	2.70	....	15.40	10.14	65.8	
141	Aug. Schlaver, jr	Rockland	....do	May 20	Oct. 18	Sandy loam	3.55	48,787	13.78	9.20	66.7	Barnyard manure.
142	O. F. Elwell	West Salem	....do	May 12	Oct. 15	....do	1.75	43,200	16.15	12.28	76.1	Horse manure.
	Average						2.17	30,401	16.88	12.88	76.3	
143	R. T. Lillie	Darlington	Lafayette	May 22	Oct. 23	Prairie	1.77	52,708	15.35	11.81	76.9	Unmanured.
144	R. D. Seeby	Elk Grove	....do	May 3	Oct. 17	Black loam	2.30	....	15.62	11.18	71.6	
145	E. M. Curheit	....do	....do	May 15	Oct. 20	....	1.98	....	16.60	13.32	80.3	Farmyard manure.
146	Th. Buxton	Etna	....do	June 18	Oct. 9	Clay	1.37	....	16.18	12.78	79.1	Unmanured.
	Average						1.86	52,708	14.94	12.27	77.0	

* Beets much wilted.

† Last year 33 tons of beets were obtained on same land.

‡ Beets considerably wilted.

Sugar beets in Wisconsin, season of 1891, arranged alphabetically according to counties—Continued.

No.	Name of grower.	Post-office.	County.	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Yield per acre.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
							Pounds.	*Pounds.*	*Per cent.*	*Per cent.*		
147	H. Brennecke	Antigo	Langlade	May 20	Oct. 10	Sandy loam	1.60	48,120	15.85	12.91	81.4	Unmanured.
148	Thos. Martin	Merrill	Lincoln	May 30	Oct. 12	Clay loam	.68	16,355	17.00	14.90	83.5	Horse manure.
149	F. W. Rades	Kiel	Manitowoc	May 10	Oct. 23	Sandy	.63	9,600	18.10	14.47	80.0	Do.
150	A. Bleser	Manitowoc	do	May 15	Oct. 4	Black loam	1.48	....	15.40	11.99	77.9	Unmanured.
151	H. C. Koch	do	do	May 8	Sept. 15	Sandy loam	.98	....	18.50	14.79	79.9	D0.
152	W. Wedencamp	do	do	May 26	Oct. 5	Loam	5.70	....	17.22	13.74	79.9	Barnyard manure.
153	B. Doolan	Maple Grove	do	May 15	Oct. 3	Sandy loam	2.63	27,000	15.22	11.70	76.9	Do.
154	J. Cochems	Mishicot	do	May 20	Oct. 16	Loam	1.50	16,000	15.05	10.82	71.9	Stable manure.
155	J. Thielke	School Hill	do	May 9	Oct. 7	Light soil	4.40	....	14.65	10.43	71.2	Do.
156	Max Boehm	Taus	do	May 15	Oct. 5	Black loam	3.85	40,511	13.70	9.80	71.5	Do.
157	J. Reznicek	do	do	May 30	Oct. 12	Gravel	1.29	....	16.15	12.52	77.6	Unmanured.
	Average						2.49	23,278	15.44	12.25	79.3	
158	James Graham	Colby	Marathon	May 23	Oct. 7	Clay loam	71	31,302	15.11	11.54	76.4	Ashes.
159	Th. Wehrman	Demy	do	May 15	Oct. 15	Black soil	1.82	....	14.75	10.43	70.7	Manured.
160	Thomas O'Connor	Halder	do	May 28	Oct. 20	Loam	2.08	....	16.72	12.47	74.5	Barnyard manure.
161	C. Weizenicker	Knowlton	do	May 15	Oct. 15	Sandy	1.13	8,000	15.60	11.93	76.5	Do.
162	A. Priest	Mosinee	do	May 25	Oct. 16	Loam	1.00	73,130	16.34	12.52	76.7	Unmanured.
163	L. Spindler	Rozellville	do	May 4	Oct. 8	Sandy clay	1.70	15,990	14.70	11.73	79.8	Stable manure.
164	F. Feckner	Wausau	do	May 12	Oct. 6	Black soil	1.05	....	19.10	15.95	83.5	
165	A. Baeseman	Wein	do	May 11	Oct. 26	Clay	1.03	....	17.88	13.21	73.9	Horse manure.
166	F. Bauman	do	do	May 10	Oct. 30	do	73	....	18.78	14.24	75.9	Unmanured.
	Average						1.25	32,106	16.55	12.67	76.5	
167	J. J. O'Leary	Peshtigo	Marinette	May 10	Oct. 14	Sandy loam	3.32	57,064	13.45	8.59	63.8	Stable manure.
168	H. Treffler	do	do	May 8	Oct. 29	Heavy soil	3.20	....	13.72	8.95	65.3	
	Average						3.26	57,064	13.59	8.77	64.5	
169	H. L. Moore	Wauwatosa	Milwaukee	May 7	Oct. 6	Sandy loam	1.29	39,640	18.02	12.15	67.5	Barnyard manure.
170	F. A. Meissner	Cashton	Monroe	May 16	Oct. 12	Clay	82	61,444	18.82	16.15	85.8	Stable manure.
171	A. Boetther	Kirby	do	June 20	Oct. 10	Sandy loam	1.68	3,150	14.0	10.00	71.3	
172	A. G. Aylesworth	Leon	do	May 20	Oct. 23	Loam	1.85	25,210	14.70	11.30	76.9	Horse manure.
173	C. A. Voelz	Portland	do	May 19	Oct. 13	Clay	1.85	26,448	15.90	12.91	81.2	Unmanured.
174	William Schmitz	St. Marys	do	June 1	Oct. 14	Loam	3.13	....	15.28	10.94	71.6	
175	A. Schlaver, sr	Sparta	do	June 4	Oct. 19	do	2.58	....	13.86	9.03	65.2	Do.
176	Roswell Smith	do	do	May 24	Oct. 19	do	3.75	16,988	16.72	12.41	74.2	Do.
177	J. K. Davis	do	do	May 20	Oct. 24	Sandy	1.45	24,000	19.05	13.32	70.0	Barnyard manure.
178	F. Kemnow	Tomah	do	May 8	Oct. 1	Loam	1.90	....	16.80	14.21	84.6	Do.
179	E. G. Kinne	do	do	May 29	Oct. 9	Sandy loam	1.48	....	15.52	11.69	75.3	Unmanured.

180	B. Drowatzky	do	do	May 21	Oct. 15	Heavy clay	2.17		15.84	11.65	73.6	Barnyard manure.
181	L. D. Wya[illegible]	do	do	May 28	Oct. 19	Sandy	*1.55	4,654	19.28	14.96	77.6	Do.
182	A. Scott	Warrens Mills	do	May 12	Oct. 15	Sandy loam	2.43	48,352	16.02	12.64	78.9	Do.
	Average						2.05	26.281	16.28	12.40	76.2	
183	J. S. Harvey	Chase	Oconto	May 15	Oct. 10	Sandy	2.12		15.55	12.17	78.3	Manured.
184	A. W. Boettcher	do	do	May 12	Oct. 16	Sandy loam	2.05	11.520	15.12	11.26	74.4	Unmanured.
185	Jos. Woulier	Lena	do	May 13	Oct. 23	do	3.00	26,890	20.00	16.27	79.7	Sheep manure.
186	James Bedore, jr	Little Suamico	do	May 25	Oct. 12	do	2.05		16.08	13.01	80.9	Barnyard manure.
187	James Bedore, sr	do	do	May 25	Oct. 12	do	2.20		15.90	13.20	83.1	Do.
188	A. Kirchner	do	do	May 20	Oct. 15	Sandy	5.68		14.65	10.81	73.8	Do.
189	Carl Birr	Morgan	do	May 21	Oct. 12	Loam	2.80	13.500	16.78	13.64	81.3	Unmanured.
190	E. J. Martindale	do	do	May 12	Oct. 15	Clay loam	2.18	72,000	16.10	13.06	81.2	Do.
191	A. Dudden	Oconto	do	May 11	Oct. 10	do	1.07	30,040	16.42	13.63	83.0	Barnyard manure.
192	J. V. Herriman	do	do	May 20	Oct. 4	Loam	.95		18.82	15.10	80.2	
193	J. A. Schweiberg	Spruce	do	May 15	Oct. 19	Clay loam	1.02		19.45	15.77	81.1	
	Average						2.28	30,790	16.81	13.45	80.1	
194	E. Gardner	Appleton	Outagamie	May 20	Oct. 10	Clay	3.17		14.24	9.99	70.2	
195	A. Becher	Becker	do	May 20	Oct. 15	Black loam	4.05	17.976	13.78	10.50	76.2	Unmanured.
196	C. Boehler	do	do	May 25	Nov. 5	Clay	1.32		18.62	14.33	77.0	Stock manure.
197	J. P. Hinz	Binghamton	do	May 20	Oct. 15	Sandy	.88		12.82	10.54	82.2	
198	C. Kreutzberg	Bungert	do	May 20	Oct. 17	Black sand	3.98		13.30	9.27	69.7	
199	H. Wickert	Mackville	do	May 25	Oct. 15	Sandy	1.92		18.14	14.02	77.2	Barnyard manure.
200	G. Breyer	Medina	do	May 16	Oct. 21	do	1.30	25,408	16.00	11.29	70.6	Do.
201	H. W. Kickhofer	New London	do	May 20	Oct. 10	Loam	1.35	10,890	15.22	12.60	82.8	Hog manure.
202	Joshua Bull	Seymour	do	May 11	Oct. 20	Clay loam	3.35	67,200	15.90	11.29	71.0	Unmanured.
203	E. Nickel	do	do	May —	Nov. 4	Sandy loam	3.55	38,400	15.62	11.98	76.7	Barnyard manure.
204	D. M. Torrey	Shiocton	do	May 10	Oct. 9	do	1.78	80,160	13.10	9.55	72.9	Unmanured.
205	M. H. True	do	do	May 14	Oct. 9	do	2.08	72,072	14.00	10.11	72.3	Barnyard manure.
206	W. D. Barnes	do	do	May 15	Oct. 6	Clay loam	1.17	67,840	15.63	12.40	79.3	Do.
	Average						2.30	47,481	15.11	11.37	75.2	
207	Chas. Mueller	Cedarburg	Ozaukee	May 18	Oct. 22	Loam	1.42	43,560	17.00	14.01	82.4	Stable manure.
208	F. Musbach	Grafton	do	May 16	Oct. 12	Red clay	3.32	32,000	15.82	12.06	76.2	Unmanured.
209	Jos. Fleiszner	Saukville	do	May 20	Oct. 3		1.78	48,410	18.50	13.84	74.8	
	Average						2.14	41,327	17.11	13.30	77.7	
210	F. Pittman	Arkansaw	Pepin	May 11	Oct. 5	Loam	1.47	28,832	16.90	13.77	81.5	Unmanured.
211	A. Faarst	Durand	do	June 7	Oct. 13	Sandy clay	1.50	14,400	15.05	12.36	82.0	Do.
212	A. J. Yazk	do	do				3.40		17.68	13.16	74.5	
213	J. Wisinger	do	do	May 15	Oct. 20	Loam	*1.37		23.04	17.08	74.1	
	Average						1.94	21,616	18.17	14.06	77.4	
214	J. O. Marber	Osceola Mills	Polk	June 3	Oct. 5	Sandy loam	.93		14.70	11.09	75.4	Barnyard manure.

* Beets somewhat wilted.

Sugar beets in Wisconsin, season of 1891, arranged alphabetically according to counties—Continued.

No.	Name of grower.	Post-office.	County.	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Yield per acre.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
							Pounds.	*Pounds.*	*Per cent.*	*Per cent.*		
215	Edw. Young	Almond	Portage	May 20	Oct. 22	Loam	.83	9,681	18.30	14.32	78.3	Cow manure.
216	A. P. Andrews	Amherst	...do	May 23	Oct. 13	Sandy loam	1.17	14,810	13.52	9.64	71.3	
217	G. Hoffman	...do	...do	May 25	Oct. 26	...do	3.33	58,490	14.98	10.35	69.0	Unmanured.
218	George Russell	Plover	...do	May 28	Oct. 12	Sandy	1.35	....	15.18	12.03	79.3	Do.
219	George Trageser	...do	...do	June 4	Oct. 17	Sandy loam	.97	10,800	16.66	11.99	71.9	Hog manure and ashes.
220	James Wilson	Stevens Point	...do	May 20	Oct. 8	...do	.87	14,400	13.82	10.64	77.0	Unmanured.
221	William Giese	...do	...do	June 15	Oct. 23	Black loam	2.17	42,150	16.32	11.92	73.1	Cow manure.
	Average						1.53	25,055	15.55	11.56	74.3	
222	John Spicker	Burlington	Racine	May 12	Oct. 24	Sandy	1.48	....	16.75	13.91	83.1	Unmanured.
223	Adam Apple	North Cape	...do	May 1	Oct. 10	Black sandy	3.53	....	17.88	14.20	79.4	
224	W. J. Hansche	Racine	...do	May 9	Oct. 13	Heavy soil	1.62	21,038	19.00	15.53	82.9	Do.
	Average						2.21	21,038	17.88	14.41	80.6	
225	Edw. Roberts	Buck Creek	Richland	May 27	Oct. 7	Timber soil	.77	37,785	16.15	12.40	76.8	Do.
226	...do	...do	...do	May 27	Oct. 28	Loam	1.52	32,440	15.12	10.63	71.9	Do.
227	G. A. Casswell	Lone Rock	...do	May 25	Oct. 13	Sandy	2.45	....	14.70	11.20	76.3	
228	W. T. Cass	...do	...do	May 19	Oct. 31	...do	.55	....	17.65	15.06	85.4	Do.
229	C. E. Jaquish	Neptune	...do	May 15	Oct. 12	Clay loam	3.35	8,000	15.28	11.04	72.3	Cow manure.
230	C. M. Porter	Richland Center	...do	May 19	Oct. 14	Clay	2.62	....	15.35	11.60	75.5	Unmanured.
231	G. Walls	Rock Bridge	...do	May 17	Oct. 16	Loam	2.18	....	15.18	11.81	77.9	Do.
232	J. M. Clark	Viola	...do	May 10	Oct. 10	Sandy loam	1.85	25,134	16.75	11.88	70.9	Do.
	Average						2.06	25,840	15.77	11.95	82.1	
233	G. W. Dawson	Beloit	Rock	May 23	Oct. 20	Sandy loam	.98	11,320	18.38	14.49	78.8	Do.
234	E. D. Wheeler	...do	...do	May 30	Oct. 7	...do	1.62	....	17.88	13.96	78.0	Manured.
235	John Tinker	Clinton	...do	May 10	Oct. 15	Muck	1.07	....	14.48	11.18	77.2	Unmanured.
236	J. Kimball	...do	...do	May 5	Oct. 29	Prairie	.87	40,000	17.70	13.19	78.0	Do.
237	E. G. Snyder	Clinton Junction	...do	May 29	Oct. 17	Black loam	1.08	....	16.05	12.01	74.9	Do.
238	J. Wadsworth	Evansville	...do	May 20	Oct. 13	Sandy loam	1.48	....	17.35	13.38	77.1	
239	F. D. Reed	...do	...do	May 20	Oct. 10	...do	1.35	....	15.98	12.72	79.6	Do.
240	N. A. Austin	...do	...do	May 7	Oct. 15	Black loam	1.62	14,016	19.65	15.69	79.8	Do.
241	A. Shumann	Hanover	...do	....	Oct. 17	Loam	2.58	....	14.92	11.37	76.2	Do.
242	Fred Burton	Janesville	...do	May 16	Oct. 20	Black lime	1.27	....	16.42	12.75	77.7	Do.
243	E. L. Bingham	Milton	...do	May 29	Oct. 1	Sandy loam	1.21	16,000	14.35	11.27	78.5	Do.
244	D. Walsh	...do	...do	Apr. 24	Oct. 24	Prairie loam	1.73	15,000	16.94	13.15	77.6	
245	W. H. Greenman	...do	...do	May 26	Oct. 20	...do	3.23	36,293	17.65	12.95	73.4	Hog manure.
246	G. C. Austin	...do	...do	....	Oct. 27	Loam	3.17	....	15.10	10.87	72.0	
247	G. B. Mackey	Milton Junction	...do	June 9	Oct. 19	Prairie	.75	22.522	17.46	13.34	76.4	Unmanured.

248	C. J. Capman	....do	....do	May 30	Oct. 28	Light black	4.17	27,110	16.78	12.83	78.3	Do.
	Average						1.76	22,783	16.77	12.82	76.4	
249	R. Searle	Baldwin	St. Croix	May 23	Oct. 20	Loam	1.43	49,558	17.88	14.20	79.4	Do.
250	Clark Greenfield	Boardman	....do	May 27	Oct. 17	Loam	4.53	....	12.12	7.84	64.7	Hog manure.
251	G. F. Hausen	Deer Park	....do	May 12	Oct. 10	Clay	1.13	60,400	16.05	11.85	73.9	Unmanured.
252	S. A. Raymond	Hersey	....do	May 9	Oct. 8	Loam	1.72	41,600	16.05	12.61	78.6	Do.
253	Geo. Martin	Hudson	....do	May 20	Oct. 20	Black sandy	2.95		15.62	10.72	68.6	
254	W. J. Hennesey	Jewett Mills	....do	June 10	Oct. 10	Clay loam	.83	....	17.22	14.18	82.4	
255	P. L. Larson	Star Prairie	....do	May 20	Oct. 22	Clay	.75	7,285	20.66	14.61	70.7	Do.
	Average						1.91	39,711	16.51	12.29	74.4	
256	Adolf Krafft	Baraboo	Sauk	June 4	Oct. 12	Black soil	1.25	69,944	17.12	13.68	79.9	Cow manure.
257	H. J. Farnum	Prairie du Sac	....do	May 19	Nov. 15	Loam	1.72	45,740	19.90	15.77	78.8	Barnyard manure.
258	W. H. Schutte	Reedsburg	....do	May 20	Oct. 22	Clay loam	2.25	26,880	17.38	12.89	74.2	Do.
	Average						1.74	47,521	18.13	14.11	77.8	
259	Albert Ayres	Hayward	Sawyer	May 9	Oct. 7	Black sand	2.88	52,200	14.48	10.69	73.8	Horse manure.
260	W. H. Carpenter	Aniwa	Shawano	June 10	Oct. 12	Loam	1.13	42,690	17.12	13.24	77.4	Do.
261	L. S. Rouse	Belle Plaine	....do	May 13	Oct. 21	Sandy	1.58	23,720	16.10	12.36	76.8	Do.
262	J. C. Campbell	Cecil	....do	June 7	Oct. 25	Sandy loam	1.30	54,230	21.28	16.52	77.7	Do.
263	Felix Barth	Laney	....do	May 13	Sept. 28	Clay loam	2.65	31,920	15.28	11.19	73.3	Manured.
264	G. Thomas	Shawano	....do	May 13	Oct. 10	Sandy	1.82	....	11.42	7.12	62.4	Do.
265	J. C. Roper	Wellenberg	....do	May 23	Oct. 12	Sandy loam	2.43	....	15.28	11.79	77.2	Unmanured.
	Average						1.82	38,140	16.08	12.04	74.9	
266	A. R. Munger	Boltonville	Sheboygan	May 23	Oct. 15	Clay	2.82	7,600	15.62	12.23	78.3	Do.
267	Mrs. Laycock	Cascade	....do	May 20	Oct. 10	....do	2.30	21,409	15.86	12.00	75.7	Do
268	P. Doane	Oostburg	....do	June 15	Oct. 20	Heavy clay	2.32	....	16.85	12.17	72.2	Stable manure.
269	Theo. Haney	Palmyra	....do	June 8	Oct. 23	Sandy	2.13	17,896	18.14	14.97	82.6	Do.
270	N. Crumrey	Plymouth	....do	May 18	Oct. 9	Black muck	2.27	....	13.38	9.38	70.0	Unmanured.
271	L. Rehm	....do	....do	May 19	Oct. 8	Muck	2.32	....	13.30	9.46	71.1	Do.
272	N. Fisher	....do	....do	May 23	Oct. 10	Sandy loam	2.50	24,000	13.78	10.04	72.9	Stable manure.
273	L. Helmer	....do	....do	May 16	Oct. 9	Dark clay	2.02	....	15.40	11.34	73.7	Unmanured.
274	E. Schierstedt	....do	....do	May 18	Oct. 8	Sandy loam	1.43	....	16.95	12.80	75.5	Do.
275	O. Schneider	....do	....do	May 28	Oct. 9	Black muck	.80	....	14.00	9.40	67.2	Barnyard manure.
276	L. Knauer	....do	....do	June 8	Oct. 8	Sandy loam	1.20	....	13.78	8.87	64.4	Cow manure.
277	O. Bergeman	....do	....do	May 14	Oct. 7	Dark clay	.83	....	17.45	12.70	72.8	Unmanured.
278	Joseph Seil	Scott	....do	Apr. 15	Oct. 10	Light loam	1.73	8,400	14.57	10.22	70.2	
279	N. Weingartner	....do	....do	May 14	Oct. 15	Clay	3.47	105,415	15.00	10.69	71.3	Barnyard manure.
280	H. M. Groeneveld	Sheboygan Falls	....do	Apr. 28	Oct. 14	Black loam	1.98	12,000	14.20	10.42	73.4	Unmanured.
281	A. X. Hyatt	....do	....do	May 20	Oct. 20	Muck	3.10	83,640	16.50	11.59	70.3	Barnyard dirt.
	Average						2.08	24,992	15.10	11.16	73.2	
282	Thos. Brehm	Chelsea	Taylor	June 10	Oct. 12	Garden soil	2.68	5,260	16.82	11.92	70.9	
283	Geo. Hartung	Little Black	....do	May 20	Oct. 7	Sandy clay	.72	....	15.62	11.63	74.5	Manured.
284	Julius Frank	....do	....do	May 18	Oct. 10	Black clay	1.18	32,000	16.90	13.63	80.7	Cow manure.

Sugar beets in Wisconsin, season of 1891, arranged alphabetically according to counties—Continued.

No.	Name of grower.	Post-office.	County.	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Yield per acre.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
							Pounds.	*Pounds.*	*Per cent.*	*Per cent.*		
285	Geo. Schubart	Little Black	Taylor	May 8	Oct. 13	Black clay	1.67	37,000	18.82	15.02	80.0	Unmanured.
286	Ferd Lindow	Medford	...do	May 10	Oct. 7	Sandy clay	1.91	....	17.11	13.62	79.6	Cattle manure.
287	F. Helwig	...do	...do	June 10	Oct. 6	Loam	1.58	....	15.81	12.78	80.8	Unmanured.
288	Fred. Moser	...do	...do	May 12	Oct. 8	Clay	1.20	23,200	16.45	13.30	80.9	Stable manure.
289	F. H. Wehmann	...do	...do	May 6	Oct. 12	Sandy loam	1.67	9,714	15.98	12.77	80.0	Horse manure.
290	F. L. Dietrich	...do	...do	May 14	Oct. 15	Heavy clay	2.92	....	12.82	8.28	64.6	Cattle manure.
291	Jos. Erbem	Stetsonville	...do	May 15	Oct. 7	Loam	1.73	9,600	15.72	12.86	81.9	Do.
292	Jos. Reinolt	Whittlesey	...do	May 30	Oct. 13	Sandy loam	.88	....	17.00	14.59	85.8	Unmanured.
293	K. F. Hanel	...do	...do	May 20	Oct. 8	...do	1.08	57,60	17.12	13.46	78.6	Cattle manure.
294	F. Willener	...do	...do	May 20	Oct. 3	Sandy humus	1.77	....	17.00	12.64	74.4	Do.
	Average						1.54	17,505	16.39	12.81	78.2	
295	B. Tollefson	Eleva	Trempealeau	May 15	Oct. 15	Clay	1.98	....	15.90	12.21	76.8	Straw manure.
296	P. H. Claussen	Frenchville	...do	May 20	Oct. 27	Mild loam	.58	24,752	17.85	15.03	84.2	Unmanured.
297	...do	...do	...do	May 20	Oct. 27	...do	1.13	41,216	18.48	15.57	84.3	Barnyard manure.
	Average						1.23	32,984	17.78	14.27	80.3	
298	J. T. Brinkman	Coon Valley	Vernon	May 20	Nov. 15	Heavy clay	3.65	13,200	15.56	11.40	73.2	Do.
299	J. P. Riley	Hillsboro	...do	May 30	Oct. 15	Clay	1.05	....	15.75	10.12	64.2	Unmanured.
300	J. B. Johnson	Newry	...do	May 15	Oct. 13	...do	1.58	....	15.05	11.37	75.5	Do.
301	A. H. Rolfe	Rockton	...do	May 16	Oct. 12	Clay loam	2.23	....	13.50	9.29	68.8	Barnyard manure.
302	M. F. Hopkins	...do	...do	May 10	Oct. 14	...do	1.35	26,354	16.28	13.49	82.9	Unmanured.
303	P. M. Randall	Sugar Grove*	...do	May 12	Oct. 15	Clay	1.92	22,651	15.80	12.80	81.3	Do.
304	Edgar Eno	Valley	...do	June 1	Oct. 27	Sandy loam	1.13	....	18.08	14.80	81.8	Do.
305	A. Newland	...do	...do	June 1	Oct. 27	...do	1.82	....	15.86	11.79	74.3	Do.
306	F. C. Clark	Victory	...do	May 20	Oct. 17	Heavy clay	2.50	38,000	16.82	11.79	70.1	
307	Harry Clark	...do	...do	May 25	Oct. 14	...do	1.50	30,000	18.32	14.70	80.2	Do.
308	F. H. Buchanan	...do	...do	June 7	Oct. 31	Clay loam	1.78	22,860	16.38	13.56	82.8	Do.
	Average						1.96	25,511	16.13	12.19	75.6	
309	A. W. Arwood	Heart Prairie	Walworth	May 20	Oct. 31	Prairie loam	1.22	18,610	20.18	16.84	83.4	Do.
310	G. V. Weeks	Lyons	...do	May 15	Oct. 14	Black muck	3.32	85,378	14.48	11.26	77.7	Do.
311	H. Larson	Sharon	...do	May 26	Oct. 24	Clay loam	1.10	18,070	21.82	18.27	83.7	Do.
312	B. Lester	...do	...do	May 30	Oct. 20	Heavy clay	2.27	46.200	17.96	13.37	74.4	Do.
313	W. Zohrlaut	Vienna	...do	May 12	Oct. 16	Black soil	2.70	....	15.40	11.10	72.1	Do.
314	J. B. Smith	Whitewater	...do	May 20	Oct. 14	Sandy loam	2.35	34,944	15.40	11.61	75.4	Stable manure.

315	M. J. Bagley	....do	....do	June 10	Oct. 10	Clayey sand	2.53	51,200	13.95	8.84	63.4	Horse manure.
316	H. H. Wede	....do	....do	May 28	Oct. 19	Burr oak land	2.80	39,204	14.32	10.88	76.0	Unmanured.
317	W. MacDonald	....do	....do	May 9	Oct. 15	Prairie loam	3,72	16,227	14.92	10.82	72.6	Do.
	Average						2.45	38,729	16.49	12.55	76.1	
318	A. Dahlstrom	Shell Lake	Washburn	May 21	Oct. 15	Clayey sand	.68	20,909	15.68	12.00	76.6	Horse manure.
319	Wm. Row	Boltonville	Washington	May 15	Oct. 14	Clay	1.67	5,899	15.35	10.92	71.2	Cow manure.
320	M. L. Barney	Hartford	....do	May 13	Oct. 19	Clay loam	1.35	22,000	17.96	14.32	79.9	
321	W. Meier	Nenno	....do	May 11	Oct. 27	Clay	1.23	....	20.12	15.31	76.0	Do.
322	Sam. Salter	Salter	....do	May 14	Oct. 12	Black loam	3.83	9,600	14.25	10.18	71.5	Barnyard manure.
323	F. Van Rhienen	South Germantown	....do	May 16	Oct. 20	Sandy loam	†1.87	48,000	20.78	17.64	84.9	Stable manure.
324	......do	....do	....do	May 16	Oct. 20	....do	‡1.57	48,000	22.60	19.39	85.8	Do.
325	John Gebhardt	....do	....do	May 5	Oct. 23	....do	† .88	....	19.05	13.80	72.5	Do.
326	......do	....do	....do	May 5	Oct. 23	....do	†1.23	....	19.54	14.12	72.3	Do.
327	Geo. Gebhardt	....do	....do	May 15	Oct. 30	....do	†1.30	....	17.44	13.26	76.0	Do.
328	......do	....do	....do	May 15	Oct. 30	....do	‡1.78	....	18.38	14.56	79.3	Do.
	Average						1.67	26,700	18.55	14.35	75.7	
329	H. T. Jeffrey	Colgate	Waukesha	May 21	Oct. 16	Clay	1.98	....	16.32	12.25	75.0	Barnyard manure.
330	W. C. De Wolf	Eagle	....do	May 11	Oct. 26	Sandy loam	2.13	....	16.82	13.45	80.0	Do.
331	J. J. Finney	Genesee	....do	June 15	Nov. 4	....do	§1.27	16,020	21.06	16.25	77.3	Unmanured.
332	W. D. Anstey	Hartland	....do	May 10	Oct. 17	Clay	3.70	....	13.50	8.85	65.6	Barnyard manure.
333	G. M. Bancroft	Menomonee Falls	....do	May 11	Oct. 15	Clay loam	1.90	....	16.10	13.27	82.5	Do.
334	G. Greif	....do	....do	May 6	Oct. 20	Sandy loam	†1.52	....	18.20	13.99	76.9	Do.
335	......do	....do	....do	May 6	Oct. 20	....do	‡1.50	....	19.76	15.38	77.8	Do.
336	F. Peardon	Ottawa	....do	May 25	Nov. 4	Black sandy	2.13	....	16.02	10.52	65.6	Unmanured.
337	M. Andree	Pewaukee	....do	May 20	Oct. 20	Sandy loam	2.28	28,080	18.78	14.84	79.0	Stable manure.
338	A. J. Fraser	Vernon	....do	May 20	Oct. 29	Black loam	2.33	35,720	18.08	14.53	80.4	Do.
339	J. Bias	Waterville	....do	May 20	Oct. 21	Black sandy	2.15	....	16.56	13.15	79.4	
340	S. A. Baird	Waukesha	....do	May 9	Oct. 13	Clay	3.53	....	13.55	8.94	66.0	Horse manure.
341	J. Wright	....do	....do	May 20	Oct. 15	....do	3.37	....	14.28	10.18	71.3	
	Average						2.29	26,607	16.85	12.74	75.6	
342	Geo. A. Phillipps	Bear Creek	Waupaca	May 15	Oct. 19	Sandy loam	2.20	29,185	14.48	11.09	76.6	Barnyard manure.
343	F. E. Koeller	Embarrass	....do	May 28	Oct. 15	Clay	2.33	....	15.85	11.95	75.5	Do.
344	D. Marshall	Manawa	....do	May 20	Oct. 16	Rich loam	2.02	50,830	17.22	12.52	72.7	Sheep manure.
345	H. J. Teed	Marble	....do	May 15	Oct. 17	Clay	1.33	....	17.22	14.05	81.4	
346	Aug. Kussmann	Marion	....do	May 14	Oct. 14	Sandy	2.35	....	15.58	12.31	79.0	
347	F. Bohlman	New London	....do	May 27	Oct. 13	Black loam	.88	22,216	14.0	10.76	76.9	Cow manure.
348	W. Brehmer	Readfield	....do	May 16	Oct. 28	Sandy clay	1.72	....	16.60	12.39	74.6	
349	Aug. Piddle	Symco	....do	May 12	Oct. 20	Clay	2.73	8,160	17.14	13.14	76.6	Stable manure.
350	R. H. Hall	....do	....do	May 11	Oct. 16	Sandy loam	.85	30,958	17.50	14.30	81.7	Unmanured.
351	G. Williams	Waupaca	....do	June 11	Oct. 19	....do	.85	30,880	18.10	14.03	77.5	Barnyard manure.
352	E. Townsend	....do	....do	May 29	Oct. 26	....do	1.27	11,840	18.52	14.26	77.0	Do.
353	P. L. Van Epps	Weyauwega	....do	May 10	Oct. 6	....do	1.75	19,188	15.40	11.52	74.8	Do.
	Average						1.69	25,407	16.55	12.69	76.7	

* Beets grown in Crawford County. † German seed from Quedlinburg. ‡ Le Maire's Richest, from U. S. Department of Agriculture. § Beets somewhat wilted.

Sugar beets in Wisconsin, season of 1891, arranged alphabetically according to counties—Continued.

No.	Name of grower.	Post-office.	County.	Time of planting.	Time of harvesting.	Soil.	Average weight of beets.	Yield per acre.	Solids in juice.	Sugar in juice.	Purity coefficient.	Remarks.
							Pounds.	*Pounds.*	*Per cent.*	*Per cent.*		
354	C. A. Davenport	Auroraville	Waushara	June 13	Oct. 22	Clay	1.35	78,408	16.20	10.75	66.3	
355	J. G. Reinke	Pine River	do	June 1	Oct. 1	Sandy	1.83	43,560	15.45	12.48	80.8	Unmanured.
356	E. Post	Wautoma	do	May 25	Oct. 22	Sandy loam	1.15	30,492	18.55	14.61	78.7	Hen manure.
	Average						1.44	50,820	16.77	12.95	76.3	
357	J. L. Knott	Allenville	Winnebago	May 2	Oct. 20	Clay loam	2.00	5,200	18.14	13.94	76.9	Barnyard manure.
358	J. Bareis, jr	Eureka	do	May 4	Oct. 17	Sandy loam	3.05	43,996	13.95	10.92	78.3	Unmanured.
359	W. W. Noble	do	do	Apr. 20	Oct. 17	Black soil	1.48	36,588	16.22	12.58	77.5	Do.
360	J. W. Tobey	Neenah	do	May 20	Oct. 16	Clay loam	.78	38,080	19.72	14.69	74.5	Barnyard manure.
361	F. Fuller	do	do	May 10	Oct. 10	Sandy loam	*3.88	24,000	18.20	13.64	75.0	Unmanured.
362	G. Olds	do	do	May 20	Oct. 25	Clay loam	*1.58		17.70	11.05	62.4	Manured.
363	F. H. Teqtmeier	Omro	do		Oct. 14	Sandy loam	1.07		14.48	10.39	71.5	
364	A. Shelton	do	do	May 11	Oct. 10	Clay loam	.88	26,136	18.78	15.50	82.7	
365	M. B. Green	Oshkosh	do	May 19	Oct. 18	do	1.83	23,522	16.78	12.27	73.2	Unmanured.
366	J. F. Miller	Picketts	do	May 21	Oct. 16	Rich loam	1.75	41,328	14.70	11.16	76.8	Do.
367	P. Tenneson	Winnebago	do	May 20	Oct. 17	Red clay	1.10	12,800	18.15	13.75	75.8	
	Average						1.67	27,961	16.98	12.72	75.0	
368	F. E. Taylor	Centralia	Wood	May 10	Oct. 18	Clay	1.48	12,960	17.28	13.80	79.9	Barnyard manure.
369	J. S. Lindahl	do	do	June 10	Oct. 21	Heavy clay	3.28	63,220	16.00	11.82	73.9	
370	W. S. Miller	Grand Rapids	do	May 15	Oct. 10	Sandy loam	1.35		15.40	12.38	80.4	Ashes.
371	C. H. Wood	do	do	June 5	Oct. 10	Sandy	1.62		16.62	13.65	82.1	Unmanured.
372	Mrs. R. B. Tarbox	Pittsville	do	May 18	Oct. 17	Heavy clay	3.00	26,880	17.14	13.19	77.0	Barnyard manure.
373	E. Letwan	Vesper	do	May 20	Oct. 15	Clay	3.30		14.58	10.76	73.4	Do.
	Average						2.34	34,353	16.17	12.60	77.8	

* Beets somewhat wilted.

We give below extracts from the remarks with which the different farmers accompanied the description of the beets sent in for analysis by them. The figures refer to the numbers in the preceding table:

3. Seed did not come up for a month after planting, June 14.

13. This variety does not yield as well as No. 12, but seems to mature earlier.

14. Cutworms ravaged beets badly when they came up first.

16. No rain from April 25 to June 14, and none from July 1 to September 30, to wet the ground more than about an inch; in fact it has been the driest season that the oldest settler has seen.

19. Some insects or bugs hard on beets and rutabagas by side of them in the spring.

23, 24. Only one row harvested, hence the excessive yield.

30. I think in a good growing season I could get as many again from the same ground.

35, 64. The seeds lay in the ground for about four weeks before coming up.

54. Last crop grown on land wheat; the field was not manured for four years.

58. Harvested a great many beets that weighed 9 to 10 pounds.

62. Not more than two-thirds of a crop.

79. Cutworms destroyed fully one-half the plants.

80. Had the season been more favorable and they had received proper care and cultivation, the yield would have been three times as great.

81. The crop was nearly destroyed by cutworms.

85. This is not more than half a crop.

89. The like of the drought not seen in the State since 1865.

90. No rain for about three months to wet the ground.

92. I would rather plant potatoes and sell them at 25 cents a bushel and buy my sugar than to raise sugar beets.

97. Time expended planting, cultivating, and harvesting plat (one twenty-fourth acre), twenty-eight and one-half hours. (This would equal an expense of $4.56 per ton of beets, valuing one hour labor for one man 10 cents, and the yield of beets 15 tons per acre; see further under No. 247.)

100. Some of the beets were entirely stripped of leaves by a black bug.

101. The beets seem to stand drought much better than other roots. Had turnips, carrots, etc., on same ground, and they are worthless. My cow relished them and gave a good flow of milk.

120. I think I could raise 40 tons per acre in good season.

143. I think I can raise 1,200 bushels to the acre.

154. It was too dry for the seed to sprout until June 15, and then insects gnawed the plants off. The plot was only half covered with beets.

156. Had some beets of 9 pounds weight.

160. There is not more than half the yield there would be in an ordinary season.

162. Judging from the very bad season here for this kind of crop, I think they would be a very profitable crop to raise for any purpose that they can be used for.

167. Several beets weighed 9 to 10 pounds.

191. The seed did not germinate for nearly a month after planting, and then so unevenly that a careful transplanting could not produce an even stand.

193. Never had such weather in the last ten years.

199. Seed came up about June 25.

225. Beets are better than other roots for cows giving milk. They keep through the winter as good or better than potatoes.

235. Can be grown as well as potatoes, but, like everything else, the labor beats the balance sheet.

242. I have no doubt but that beets can be profitably grown if the rows are put far enough apart so the greater part of the work can be done with a horse.

247. It required 22 hours 35 minutes time for one man to plant, hoe, cultivate, thin, dig, top, and put in the cellar. Size of plat, 4,620 square feet. (This would

equal an expense of $1.42 per ton of beets, assuming cost of labor and yield as under No. 97.)

261. Obtained first premium at the county fair for the beets.

262. Beets were scarcely up by July 4; growth began about September 1.

266. Not more than 10 per cent of seed germinated, on account of season being so dry.

295. Cutworms killed a good share of the beets.

302. There was 1 pound of tops to 10 pounds of beets.

309. The season was unfavorable for most crops, nearly all summer being very dry. Corn did not do more than half.

311. I noticed a black bug an inch long from the middle of July to the last of August, which injured the leaves of the beets considerably. I have frequently noticed the same bug on potatoes. If you send me seed for next season I think I shall do considerably better, having learned some by experience.

317. During the hot weather in August swarms of black bugs, one-half an inch in length, went for the tops in places, making a clean sweep as far as they went, eating the tender part of the leaf, leaving nothing but the limb. The bugs remained about three weeks; the damage retarded the growth of the beets for a short time, but they recovered entirely from the injury and most of them are quite large now. * * * Am satisfied sugar beets would do well in this neighborhood. * * * My experience this year shows they are determined to grow in the soil here no matter how long the drought or how many bugs they have to contend with.

330. For growing beets manure year before planting, to have manure well rotted.

342. The season being very dry the seed did not come up until June 25. * * * The seed being of good quality made a good stand. Had the season been favorable the yield could have been at least one-half more. Considering the very dry season I think sugar beets withstand the drought better than the Yellow Tankard mangel planted along side of them, the beets being deeper rooted.

351. The season has been the driest that I ever experienced in Wisconsin. It is really wonderful that I got as good a crop as I have harvested.

352. I think a common season ought to double the yield.

353. The seed lay in the ground six weeks before germinating. With the same growing weather as in 1890 should have had twice the amount, for my land was far better than last year.

365. It has been an extremely dry season. Consider them almost a total failure.

From the tables of analyses we deduct the following statements:

Lowest analysis, 1891	per cent sugar in the juice	7.12
Highest	do	23.52
Average of 373 analyses	do	12.56
Average estimated yield of beets per acre	pounds	31,090

The average per cent of sugar in the juice for this year came at 12.56. This may be considered a fair average, although there is evidently considerable room for improvement. The average for Germany during the past season is estimated at 12.55 per cent. Last year the beets analyzed at this station (93 in all) averaged 12.46 per cent of sugar in the juice. Only eleven farmers sent in beets both years; the average of the samples furnished by these were, in 1890, 11.85 per cent; in 1891, 14.30 per cent of sugar in the juice, or 2.45 per cent increase in 1891. This would tend to show that the main reason for the rather inferior quality of beets grown by many farmers lies in their unacquaintance with the sugar beet and its culture; excepting the eleven farmers who furnished samples both years, there were only a very few who had had any previous experience in growing sugar beets. Another reason lies in the fact that the farmers are apt to send in the largest beets grown, thinking that the larerg beets they can grow the better; doubtless the analyses given in the above table are

lower in a large number of cases than truly representative samples would have shown.

Fifteen counties furnished beets analyzing on the average above 13 per cent of sugar in the juice; beets analyzing on the average above 14 per cent were received from the following counties: Door, Green, Jefferson, Lincoln (only one analysis), Pepin, Racine, Sauk, Trempealeau, and Washington. These counties do not belong to any single section of the State, but are scattered all around, in the western, southern, and northeastern portion of the State. This would indicate that successful sugar-beet culture with us is more a question of skill in growing than a question of soil. In any part of the State there is soil well adapted to sugar-beet culture; what is wanted is farmers who understand the cultivation of the beets, and enough of them within a limited area to furnish a sufficient quantity of beets to supply a beet-sugar factory with 200 to 300 tons of beets daily for a campaign of about three months. This means the product from not less than 1,500 acres of land in an average year. Whenever these conditions are present, beet-sugar factories will be established in our midst; capital will doubtless be ready to invest as soon as there is any prospect of successful outcome. But it would be simply throwing away a fortune to enter upon the undertaking with no certainty of the supply of beets. A modern beet-sugar factory will cost at least $150,000; before beginning on the enterprise all conditions must therefore be carefully studied; the question of supply of beets is perhaps the most important of these. The results of the work done by this station during the past three years indicate that Wisconsin can grow beets in sufficient quantity and of good percentage of sugar; if this is correct, manufacturing of beet sugar will be a success with us when enough beets can be obtained to supply a beet factory.

Wyoming.—Fifteen samples were received from this State, of which 9 came from Albany County. The mean results from this county show 14.32 per cent of sugar in the beet, with an average weight of 7 ounces. The best results, all things considered, from the State are from Crook County, although only three samples were sent, showing 13.77 per cent of sugar and an average weight of 16 ounces.

In closing these remarks on the data obtained from the different States and Territories, it may be well to call attention to the fact of the remarkable extent of the area in the United States in which sugar beets of fair richness can be grown. In Bulletin 27, from theoretical considerations, a map was given showing practically where in the United States beets of exceptional richness could be grown. At the time of the publication of this map it was distinctly stated that there would be doubtless many localities without the boundaries of the proposed area in which excellent beets could be produced. The experiments, which have now been carried on for two years, show that the limits of beet-culture for sugar-making purposes are even wider than those intimated before.

Beets of fair quality have been grown as far south as Texas, and it is now believed that on most of the high plateaus of the central western portion of the United States beet-culture can be practiced with profit, especially where irrigation is possible. On account of the value of lands which are reclaimed by irrigation it is highly necessary that some crop should be grown which will pay for the intensive culture, and nothing better than the sugar beet can be recommended for this pur-

pose. It has been thoroughly demonstrated by the experiments carried on by this Department, that sugar-beet culture is possible in this country, and it only remains for the farmers of the country to indicate a willingness to grow the beets to secure the rapid development of our beet-sugar industry. The education of the farmers in this direction will doubtless be slow, but there is no reason to doubt its success. There is abundant capital in the country waiting to embark in the manufacturing part of the industry whenever it can be assured of a sufficient quantity of raw material for its operations.

BEET-SUGAR EXPERIMENT STATION AT SCHUYLER, NEBR.

Impressed with the necessity of securing in this country experimental tests of the most scientific methods of cultivating sugar beets and producing seed therefrom, I was directed by the Secretary of Agriculture in autumn of 1890 to visit Nebraska and other States with the intention of selecting a site for the establishment of such an experimental station.

The reasons which led to the selection of Nebraska as the State in which this station should be established were the fact that already a beet-sugar factory had been erected in that State and others were in process of erection, and that in its soil and climate it seemed to present a favorable locality in which to try the experiments, which, when finished, might prove of the greatest advantage to all parts of the country. The location of the station on the Pacific Coast would have placed it too far away to secure the personal control on the part of the Department which seemed to be necessary to success, while, had it been established farther east and north, it would not have so well represented all the points of soil and climate of the northern central portion of the country, in which the farmers seem to be most interested in beet-culture. Many localities were found in the State of Nebraska, and, as a result of personal inspection, two sites were favorably recommended for the location of the experiment station. The first of these was near Norfolk, in the northeastern part of the State. At this place a beet-sugar factory was in course of construction, and the people not only of the town but of the whole country were thoroughly aroused to the importance of a careful study of the beet-sugar industry. A favorable location was also offered for the establishment of the station at a distance of about a mile and a quarter from the location of the beet-sugar factory. The second place recommended was near the town of Schuyler, where two or three different plots of ground were offered, each of which seemed to possess some advantages. The Secretary finally selected Schuyler as the site, leaving the particular location in the vicinity to be determined afterward. The work therefore which is carried on at Schuyler must not be taken to represent the interests of Nebraska alone. Those interests are amply provided for by the excellent investigations of the State

station at Lincoln. Our work is to be taken for the advancement of the beet-sugar industry in general, and it has been carried on in a locality as nearly central as possible.

The plat of land which was finally selected was, in general, the best adapted to the purpose. No piece of land could lie more favorably for an experimental station. It has a gentle slope toward the south, and yet is practically level, but with a sufficient difference in altitude between its southern and northern portions to give excellent natural drainage, and yet not sufficient to produce washing during heavy rains. The soil is a deep sandy loam, and the only objection to it was that it was practically a virgin soil. Part of it had never been plowed, but the whole of it had been closely pastured for several years, so it was not exactly of the nature of the virgin prairie. The only fear entertained in select-this piece of land was that the beets would grow to a remarkable size and be deficient in sugar content. This, however, as will be found in consulting the experimental data, was prevented by close planting, which kept the beets down to below normal size and secured in them a normal development of saccharine matter.

Being unable to give my personal supervision to the work of the station, it was placed in charge of Mr. Walter Maxwell, who brought to his work a large experience in farming and a thorough comprehension of the nature of the problems to be investigated. The scope and extent of the work was thoroughly explained to Mr. Maxwell before his departure to take charge of the station, and the thoroughness with which he carried out the instructions in the conduct of the work will be more clearly perceived by a perusal of his report, which follows.

During the planting season I spent some time at the station, and also during the analytical season.

Seed of the best European varieties was especially imported for the purpose of starting the crop for the first year, and in all cases an excellent stand was secured, although the conditions for germination were somewhat unfavorable. At the time of planting, the earth was remarkably dry, and continued so until near the end of May, after which time a period of exceptional humidity prevailed, accompanied by repeated and heavy rainfalls.

In spite of these unfavorable climatic influences, however, a good stand was secured in all the plats from planting 15 to 20 pounds of seed per acre. The general scope of the work may be outlined as follows:

In the first place, it was proposed to thoroughly prepare the soil in the best approved manner. Fortunately, on account of the land having been closely pastured, the sod was plowed without difficulty. The plow was followed by a subsoiler and the soil thus loosened to a depth of from 15 to 17 inches. No difficulty whatever was experienced in securing a perfect tilth of the surface and an excellent seed bed. Not willing, however, to trust the first year's experiments to a soil so wholly

virgin in its nature, an additional plat of land was rented which had been several years in cultivation, and this was prepared in the same manner for the reception of the seed. A beet of uniform size and proper shape, with a single tap root, can not be secured until the ground is loosened to a sufficient depth to allow the normal growth of the plant. If the tap root strikes a hard piece of earth at a depth of from 7 to 9 inches, it is naturally deflected in its course, or extra roots are formed and the beet becomes misshapen and tends to grow above the surface of the soil. There is, therefore, in beet culture an absolute necessity of securing a soil loosened to a sufficient depth to allow the tap root to penetrate easily from 15 to 17 inches.

Attention should also be called to the methods of planting and the times of planting. It was decided to illustrate the effect produced by planting at different periods, beginning as early in the season as practicable and continuing until late in the spring. By reason of the peculiar climatic conditions, however, which have been mentioned, namely, the very dry April and May, the full effect of this experiment could not be determined, as the beets practically all started to grow at the same time, near the end of May. It will be necessary, therefore, to repeat such experiments as these in regard to time of planting for several years in order to determine fully the effect of early and late planting on the crop as a general rule. It will be found, no doubt, that there are many soils where early planting will prove more advantageous, while, on the contrary, many others will be found where the late planting will be the most successful. In the absence, therefore, of any experimental data of a reliable nature on this matter it will be best for sugar-beet planters who are raising beets for commercial purposes to practice early, medium, and late planting in order that they may have at least a portion of their crop suited to the season, whatever it may prove to be.

In such a climate as Schuyler there is, of course, a liability to late frosts as well as early freezes, so that all these matters should be taken into consideration in regard to the time of planting.

In regard to the manner of planting, I think it sufficiently demonstrated that nothing is superior to the method of drilling which we practiced. We found that it was an easy matter to determine the number of pounds of seed dropped per acre by tying a bag under the nose of the drill and running it back and forth over a hard road through a distance which would correspond to one-eighth or one-quarter of an acre. The bag which had secured the seed which was deposited by the drill was then removed and the amount of seed weighed. By this method we had no difficulty whatever in adjusting the drill to plant any quantity of seed required. If the experience of one season should prove of any value, then the amount of seed which we used during the past season, namely, about 17 pounds per acre, was entirely sufficient.

In regard to the depth of planting also great care should be exercised. We endeavored to have the seed deposited about 1 inch under

the surface of the earth. The beet plant, on germinating, is extremely delicate and will not force itself through a deep layer of earth; especially is this true if, subsequent to the planting and before the appearance of the plant above the ground, a heavy rain should fall, packing the earth down firmly on the seed. If one could be assured of the occurrence of very dry weather for a considerable period after planting, then depositing the seed at a greater depth would be advisable, but it would be extremely dangerous practice to follow in a country where rains are likely to occur at any time. In localities where irrigation is practiced the amount of seed employed could be easily controlled, and in this case the seed could be deposited to a greater or less depth, according to whether the soil might be more or less moist.

The object of the work in cultivation was to show in a practical way how to secure a good stand of good, healthy beet plants at as nearly as possible even distances in the rows and to illustrate the method of culture. With the sugar beet the method of culture is essentially a superficial one; no deep plowing and stirring of the ground is required. On the contrary, the principles of beet culture look to a sufficient stirring of the ground to break up the capillary connection between the surface portions and the parts below to secure the proper tilth and pulverization of the surface and to prevent the growth of weeds and grass. These are the points which are to be secured, and any method of cultivation which accomplishes these ends will be sufficient for beet culture.

When the rows of beets are planted only from 12 to 15 inches apart, as in the case of some of our experiments, hand-hoe culture is the only practicable method. The rows are too near to permit the use of horse-power. When the rows are 18 inches apart, and greater distances, culture by means of horse hoes and cultivators is, of course, more economical than hand-hoe culture. Any good garden horse hoe which will stir the surface of the soil and at the same time protect the young plants from being covered up will be found useful in beet culture. In this respect it is but fair to call attention to the fact that culture of beets by steam or electric plowing may perhaps in the future be found to be the most economical. By the use of steam plows greater care can be exercised and greater or less speed can be imparted to the plow and absolute immunity from tramping the beets secured. This, however, is a matter for the future; meanwhile we may avail ourselves of the means of cultivation which can be procured. Quite a number of hand cultivators and horse cultivators and hoes were purchased from different implement dealers, and all of them, so far as we have been able to try them thoroughly, proved to be of a satisfactory nature.

Connected with the culture work, careful meteorological observations were conducted, in order that the climatic influences could be as thoroughly studied as possible. This leads to the observation that intercontinental areas, subjected as they are to great vicissitudes of climate, will perhaps not prove as favorable to beet-culture as the marine lit-

toral portions of the country. The influence of the sea water in modifying the climate of adjacent agricultural regions is too well known to need elucidation, and the extraordinarily favorable results reported from the Pacific coast with the beets grown by farmers in general are illustrations of this fact. So, also, the vicissitudes of climate are well known without consulting the meteorological data kept by the station at Schuyler during the past season. Prolonged periods of drought in such climates are followed by heavy and repeated rains; cold and hot days follow each other in rapid succession, not only in the spring and autumn, but even in the middle of the summer. It is thus rendered important to be able to be in a measure independent of climatic conditions, and therefore the proper preparation of the soil for the seed bed and the careful cultivation of the plants are more important factors in growing beets in intercontinental areas than in localities where the climatic conditions are more equable.

A striking illustration of such changes may be cited by referring to the fact that we had scarcely secured the beets selected as mothers in the silos at Schuyler, early in November, before the temperature fell below 0° F. By reason of these extremes of climatic conditions, also, it would be proper to call attention to the fact that the silos for preserving the mother beets during the winter season must be constructed with great care. It will be necessary to wait until the spring in order to determine how successful we were in preserving the beets during the winter which is just passing. Three different silos were made, varying in the principles of construction, in the hope of determining which of the methods of preservation would prove more successful. The attendant left in charge of the silos during the winter was also instructed to watch carefully the forecasts of the weather and add extra covering to to the silos whenever the temperature was expected to be extremely low. In the same way care was directed to be paid to ventilating the silos in periods of high temperature, which occur frequently, even during the winter, in that locality.

The success which attended these efforts at scientific culture were well attested by the magnificent appearance of the fields of beets during the latter part of the summer and as they approached maturity. The plots were seen to be absolutely free of weeds and grass, and in no place, in looking over the field, could the ground be seen. The beet leaves formed a complete covering and presented in every respect a most satisfactory appearance.

An outline of the principles underlying the analytical period of the experiments will indicate the general line of work.

First of all it was proposed to determine the yield in cleaned and topped beets per acre—that is, beets ready to send to the factory—for each period of planting and for each variation in the width between the rows, and the number of beets per acre. To secure this a carefully measured portion of each plot, under the conditions above mentioned,

was harvested, prepared as if for the factory and carefully weighed. At the same time the saccharine richness of each sample was to be determined. For this purpose no selection was made in regard to the beets, but each one was taken as it grew in the row until a certain number was selected, and each of these beets was analyzed separately. In the same plat an additional number of samples was taken in groups of ten, and each sample of ten beets was submitted to a separate examination. In this way the character not only of the individual beets was determined, but also the general character of the whole plat, being taken in groups of ten. Over 100 analyses per day were made from the time of the beginning of the harvesting, early in September, until the close of the analytical work in November. The results of these analyses are sufficiently set forth in the tables which accompany the report, and the details will not be mentioned here.

Attention, however, should be called to the fact of the great variation which will be noticed in individual beets, amounting to even as much as 2 or 3 per cent, in the quantity of sugar which they contain. It may be stated, therefore, that the results are given upon the composition of the expressed juice, as with so large a number of analyses it was impracticable to determine the sugar in the pulp of the beet itself. Inasmuch as the beets, however, were all submitted to analysis directly after they were harvested, so that no opportunity was given for loss by evaporation, it may be assumed that the percentage of sugar in the juice multiplied by 95 will give approximately the total quantity of sugar present in the beets.

In addition to the analytical work a careful selection was made of the different varieties of beets to be preserved as mothers. For this purpose the whole of the remaining plat, after the analytical data were obtained, was harvested and the beets selected for mothers which showed a normal size of from 500 to 600 grams and a perfect outline. All beets varying from normal size were rejected, as likewise were all of irregular surface, multiple roots, or deformed beets of any description. These beets were very carefully harvested and handled, the leaves only being cut away without injuring the attachment of the leaves to the stems of the beet, and were carefully preserved in silos.

In order to determine the character of the beets preserved in the silos, representative samples of mothers were taken for analysis and their weight and content of sugar determined. Another portion of exactly similar beets, as nearly as possible, was carefully weighed and separately preserved in the silo. The object of this was to determine in the spring the loss in weight which the beets might have experienced during the winter, and then, by determining the sugar in the samples thus preserved, any changes which the beets might have undergone in the silo can be determined. This, then, can be used as a standard in judging of the character of the mother beets when analyzed for planting.

It is the purpose of the Department to continue the experimental work with beets, should Congress grant money for that purpose, during the coming season on the following general principles:

The entire number of plats (thirty) in the experimental field will be so divided as to bring each plat into beets once in four years. The remaining plats will be planted in ordinary crops, so as to secure a trial of the principle of rotation. The beginning of this has already been inaugurated and a number of the plats has been planted in fall wheat and rye, while an additional number will be planted in maize, oats, spring wheat, and other crops during the coming spring. All of the plats have been properly fall-plowed and prepared for the spring planting, and those plats which are to be planted in beets have been thoroughly subsoiled. At the proper time it is proposed to open the silos and examine the mothers which they contain, first, in regard to the way in which they have been preserved; second, in regard to the loss of weight of the test samples of mothers, and, third, to subject each of the beets so preserved to analysis, rejecting all which fall below a given standard and planting the remainder for the production of seed of a high grade.

It is seen from the above outline of the work that it has been organized on the best approved principles for the illustration of the most scientific methods of producing beets. Not only will the work be valuable for the data which we obtain, but especially so for serving as a sample of what such work should be, which may be a guide not only to the farmers of the country who propose to enter beet culture, but also to those who may undertake the production of sugar-beet seed of high grade to supply the planters of the country. It is perfectly well understood that the farmers themselves will not be able to grow high-grade beet seed, on account of the great cost of analytical work which it involves, and if we produce our own seed in this country it will have to be done in the way indicated in the outline above given.

REPORT OF ASSISTANT IN CHARGE.

The further details of the experimental work are found in the report of the assistant in charge, Mr. Walter Maxwell, which follows:

DIVISION OF CHEMISTRY,
U. S. DEPARTMENT OF AGRICULTURE,
Washington, D. C., February 26, 1892.

SIR: I beg to submit to you a detailed report of the work accomplished by the sugar-beet experiment station of the Department of Agriculture at Schuyler, Nebr., in the year 1891.

Very respectfully,

WALTER MAXWELL,
Assistant in charge.

Prof. H. W. WILEY,
Director.

INTRODUCTORY.

The Department sugar beet experiment station, Schuyler, Colfax County, Nebr., is located near the junction of the narrow Shell Creek Valley with the broad plain through which the Platte River runs. The station is located 6 miles in a direct line north of the Platte River, and under the south slope of the terminating line of hills which separates the Shell Creek and Platte valleys. The situation is thus protected against the action of the north, northwest, and northeast winds, and has an ample exposure to the south, west, and east.

The station farm consists of thirty 1-acre plats and 1 acre of roads and borders.

Two tracts of land were offered for the use of the experimental station, including the one selected and a tract of equal size having a north exposure. In favor of the latter tract was the circumstance that it had been under cultivation for three years, while the selected tract at the beginning of this year was practically virgin prairie. Although the condition of the soil in the field exposed to the north appeared to be in a much more favorable state than the soil of the selected field for the immediate culture of beets, the equal richness and physical properties of the soils of the two fields and the climatic advantages of the field with the south exposure caused the selection of the latter as the location of the actual experimental station. However, as the new and crude state of the soil of the station field gave some doubt concerning the results of the first year's work, it was decided to grow beets in both the stated fields and provide against a failure in case the station field was too crude for immediate beet culture. To guard against confusion, the two fields will be designated: Field A, station field with south exposure; Field B, field with north exposure.

SOIL.

The soil of the station farm appears to be uniform with the prairie soil of the Platte Valley. It is a dark loam to a depth of 2½ feet, resting upon a mixture 1½ feet thick of clay and sand, and gradually going down to a pure sand at a depth of 5 feet, which meets the normal water level at a distance from the surface of 8½ feet. It is a loose, easy-working soil, highly sensitive to variations in the temperature of the air, but very resistant of the action of the extremes of moisture and drought.

The chemical analyses of the soils gave the following results. No. 1 indicates the surface layer, 6 inches, and No. 2 the second 6 inches of the soils:

	Field A.		Field B.	
	No. 1.	No. 2,	No. 1.	No. 2.
Moisture	2.01	1.93	1.84	1.73
Organic matter	6.64	6.13	5.20	5.01
Insoluble residue	81.14	82.11	81.80	82.19
Ferric oxdie (Fe_2O_3)	3.11	2.99	4.16	4.12
Aluminic oxide (Al_2O_3)	3.19	3.26	3.98	4.02
Calcuim oxide (CaO)	0.72	0.68	0.52	0.44
Magnesia (MgO)	0.82	0.80	0.73	0.75
Soda (Na_2O)	Trace	Trace	Trace	Trace
Potash (K_2O)	0.59	0.61	0.57	0.58
Phosphoric acid (P_2O_5)	0.04	0.03	0.03	0.04
Sulphuric acid (So_3)	0.004	0.006	0.008	0.003
Chlorine (Cl)	0.020	0.014	0.019	0.012
Carbonic acid (Co_2)	1.420	1.620	1.320	1.270
Total	99.794	100.180	100.177	100.165
Nitrogen	0.28	0.25	0,28	0.25

CULTURAL SEASON.

The work of preparatory cultivation began April 9, in Field B.

The late date at which it was decided to establish the station where it is now located prevented the adoption of the most advisable plan of cultivation, and the

work which should have been done in the fall was not entered upon until late in the spring.

April 9, 4 acres in Field B, which in the past year had been planted with corn, were plowed lightly and harrowed, and the cornstalks and roots, the latter being turned out by the plow, were gathered up and hauled off. Rains prevented any further operations until April 22, when plowing and subsoiling began. The ground, which had been freed from all cornstalks and roots, and which laid quite level, was plowed to a depth of 9½ inches with an ordinary plow and the subsoiler followed to a further depth of 6 inches, so that the soil was broken up to a depth of 15 inches. The width of furrow taken by the plow was not more than 10 inches, in order to be sure that the lower soil was perfectly stirred by the subsoiler, the share of which was 9 inches broad. The land plowed each day was harrowed and dragged in the evening, to prevent it drying in a lumpy state and to lessen the loss of moisture.

April 26, the temperature of the soil in Field B was still too low for planting the seed, and it was left a few days, and 4 acres selected in Field A were plowed and subsoiled and treated further in the same way as had been done in Field B.

April 29, the seed bed of Field B, which had been quickly prepared by harrowing and dragging twice, and finally rolling after a third harrowing, had a temperature of 51° F. and the seed was put in.

Although the ground had plowed well, and each day's way was got down moderately fine with the harrow and drag, the condition of the seed bed was not satisfactory. There were no large clods, but instead of a thoroughly pulverized soil, such as can only be produced by the action of frost, the surface was made up of small clots or particles, rather than a mass of fine, moist mold.

The seeds were planted with a horse drill, taking one row. In the first place the ground was marked off in rows with a common wooden marker, making five lines at a time. The seed drill followed in each of the lines or rows left by the marker. The drill was set to deposit the seed 1½ inches deep. The seed was planted at the extreme depth on account of the extremely drying weather which had set in, with a prospect of lasting for some time. After drilling the seed in rows at a distance of 17 inches apart the ground was again firmly rolled, in order to induce the rising of the moisture of the soil to the seed bed. The surface of the soil had become decidedly dry, and there was not moisture enough in the seed bed to produce immediate germination.

Six varieties of seed were planted, including—

(1) Dippe Bros, Kleinwanzlebener.

(2) Vilmorin White Improved.

(3) Desprez & fils and Bulteau Desprez.

(4) Lemaire père et soeur.

(5) Ferd. Knauer.

(6) Kleinwanzlebener (Élite).

The average amount of seed planted per acre was 17.6 pounds, the drill, with the same sized distributing wheel, delivering 18 pounds of the Kleinwanzlebener and Élite varieties, 17.2 pounds of the Vilmorin and Desprez, and 17.5 pounds of the Lemaire and Knauer varieties.

On May 5 and 6 the ground in Field A was prepared in the same way as in Field B, and on those days the seed was put in. The seed bed in Field A was in exactly the same state as in Field B—neither rough nor in that state of moist and pulverized mold which is essentially desirable. The seed was planted 1½ inches deep, and in rows 18 inches apart. The temperature of the seed bed was 49.1° F. on the first day of planting—May 5. The amount of seed planted per acre was 16.5 pounds. The six varieties already specified were planted in Field A.

The special purposes of the planting of the large plats of the varieties of beets stated were, in the first place, to observe the results obtained from the soils and climate of the situation under the application of the best method of beet culture;

further, to note the behavior of the specified and well-established European varieties in new conditions of soil and climate; and finally, to produce and select beets of each of the named varieties for propagation uses. It may be found that the known varieties can not sustain the high standard of their characteristics in the new conditions to which they are being submitted, in which case it is considered that it will be possible and necessary to breed from the old varieties, by select crossing, new varieties which will be better adapted to the conditions and able to maintain a high standard of excellence.

In addition to the work on the large plats already described, a more minute plan of experimentation was laid out and confined to plats each 4 square rods in size, upon which three series of experiments were conducted:

(1) Distance experiments, or experiments with the purpose of observing at what distance the plants must be placed from each other to obtain the maximum results, expressed in weight of beets and sugar per acre. In the No. 1 plat the rows were placed only 12 inches from each other. In the other five plats the distances between the rows were respectively 14, 16, 18, 20, and 22 inches.

(2) Fertilizer experiments, or experiments in order to observe if any, and what, effects were produced by the application of ranging amounts of superphosphate to the beets in the virgin soil of Field A. The fertilizer was applied—

Plat 1	1 pound per rod, or 160 pounds per acre.
Plat 2	1.5 pounds per rod, or 240 pounds per acre.
Plat 3	2.0 pounds per rod, or 320 pounds per acre.
Plat 4	3.0 pounds per rod, or 480 pounds per acre.
Plat 5	4.0 pounds per rod, or 640 pounds per acre.

(3) Time experiments, or experiments for the purpose of showing the results of early and later planting, and to indicate the most advisable time for planting in such soil and climate. The planting of the plats was done as follows:

Plat 1	planted May 12.
Plat 2	planted May 19.
Plat 3	planted May 26.
Plat 4	planted June 2.

The preparation of the soil and seed bed of the small experimental plats was conducted in the same way as in the example of the larger plats. The seed was put in with a hand drill, the use of the horse drill being impracticable. The planting of the No. 1 series was done on May 11; of the No. 2 series on May 12 and 13; and of the No. 3 series as already given.

May 15, light cultivation was commenced in Field B. A part of the seed of most of the varieties had germinated and the plantlets were out of the ground sufficiently to mark the rows. Although the ground was still practically free from weeds, flat-hoeing was commenced, hoes with 8-inch blades being used, and the ground between the rows was thoroughly hoed up to 1½ inches of the plantlets. Most of the laborers were green, and had not seen a beet field before; but a short time was enough to show them the difference between taking long strokes and merely scraping the top, and short strokes, by which the surface of the soil was thoroughly moved to a depth of 1½ to 2 inches. Also the need of keeping so far from the rows as not to disturb the plantlets.

A very notable difference was observable in the six varieties in respect of the apparent vitality of the seed, as indicated by the per cent of seed which actually germinated. The "Vilmorin" variety not only came up one to two days before the other varieties, but almost the whole of the seed of that variety came up together. Next to the "Vilmorin" the "Élite" indicated the greatest vitality and soundness. Other of the varieties not only required more time to make a first appearance, but the seed kept coming up for five weeks even after a heavy rain, which indicated that seed of various ages had been put together in the samples. The actual comparative

vitality of the seed of the respective varieties is given in the following table, and shows the number of seeds out of one hundred which grew—

	Per cent.
(1) Élite, after 9 days	92
(2) Knauer, after 9 days	85
(3) Lemaire, after 9 days	87
(4) Desprez, after 9 days	88
(5) Vilmorin, after 9 days	95
(6) Kleinwanzlebener, after 9 days	90

By May 25 the plats in Field B, also in Field A, had been thoroughly flat-hoed, and some part of the former field a second time.

May 26, "thinning out" commenced in Field B. The Vilmorin variety, as already stated, had come up almost perfectly and nearly all the plantlets were large enough for "thinning." Not more than one-half of the seed of the other varieties had germinated, and, as a consequence, the "thinning out" had to be done twice, which not only increased the expense of that operation, but the plantlets were destined to be and remain of two sizes, the early plants from the first germination, and the later which germinated after the rains, and the evil of two sizes was to be seen throughout the season in the circumstance that the early plants made too large beets and the late plants too small.

From April 22 to June little rain fell, and not only was there no rainfall, but every day was warm, and the heat was accompanied by south winds, the velocity of which ranged from 15 to 20 miles per hour. The continuous drouth had a bad effect upon the early stage of the crop, which was planted in a soil quite unable, in consequence of the spring cultivation, to resist such a continuous spell of dry weather. At that period the future of the crop appeared threatened. On June 2 2 inches of rain fell, and the aspect immediately began to change.

The temperature of the soil during the germination season, and for the time included between May 1 up to the end of June, appears in the following table:

	Field A.			Field B.		
Date.	Seed bed.	6-inch deep.	12-inch deep.	Seed bed.	6-inch deep.	12-inch deep.
May.						
Mean of—						
First week	49.5	50.0	50.0	49.5	52.0	52.5
Second week	59.0	57.0	55.0	57.0	55.5	53.5
Third week	69.0	64.0	56.0	68.0	62.0	55.0
Fourth week	64.0	63.5	64.0	61.0	61.0	61.5
June.						
First week	58.0	59.0	61.0	55.0	57.0	58.5
Second week	66.0	62.0	61.0	64.0	62.0	60.0
Third week	Not taken	74.0	69.5	Not taken	72.0	68.0
Fourth week	...do	76.0	73.0	...do	73.5	72.5

Before leaving the planting and germination period of the cultural season it will be specially in place to include certain particular observations upon the nature of the climate and the comparative adaptability of the soil to given climatic conditions. It has already been said that from April 22 until June 2 no rain fell. In such respect this has been an abnormal year. The normal rainfall for the month of May would be enough for cultural purposes were other physical conditions favorable. In point of fact, the rainfall for the month of May in the State of Nebraska is equal to or exceeds the rainfall for the same month in the beet-growing districts of Europe. And again, the temperature of the State of Nebraska does not vary materially in the mean from the temperature of the European countries, although the distribution of the temperature of Nebraska is subject to very much greater fluctuations. There is,

however, a factor in the climatics of that part of the Western and Northwestern and Southwestern States which appears to be much more potent than the considerations of temperature and rainfall, and that is the *winds* of those regions. That factor reduces any comparative statements of the temperature and rainfall of the State of Nebraska and the beet regions of Europe to a small value. A comparison of the Western States with the States on the Atlantic border in respect of the rainfall and temperature is upset by the same prevailing factor. The mean temperature for the month of May in Nebraska and the beet districts of Germany does not vary more than 1 to 2 degrees, being about 59° F in Nebraska and 58° in the European country. The actual effect, however, of the temperature of Nebraska, borne as it is upon the south wind at a high daily velocity (it is notable also that the wind rises with the sun, attains its maximum velocity in the midday, and moderates or goes quite down with the setting of the sun), is much greater than in localities where the air is generally in a more stagnant condition.

Again, the action of those winds upon the evaporation of moisture from the soil is very great. The seed bed, which at sunrise is soft and moist, after noon is dried out 1 to 2 inches, and the soil is actually hard and remains so until after sundown. The evaporation process occurs to such an intense degree that the rainfall of a moist and still atmosphere, of one-half to 1 inch per week in that season, would have a much smaller effect in the intense conditions of which we have spoken.

And yet, notwithstanding the conditions of which we have spoken, and which at first sight appeared unfavorable, the growth and vigorous appearance of the beet plants of the first germination were unmistakable. The plants not only looked vigorous, but they grew rapidly. That circumstance directed attention to the nature of the soil, for it appeared very evident that an adapability in a high degree existed of the soil to the characteristics of the climate.

Following the observation stated, experiments were conducted with the purpose of ascertaining the power of the station soil to absorb moisture, both by capilliarity and from the air; and, further, the capability of the soil to retain the moisture already absorbed. In order that the results of such experiments should be apparent they had to be made comparative, and samples of soil were obtained from the experimental stations of La Fayette, Ind., and College, Md., which samples were sent to us through the courtesy of Prof. Huston of the former and Maj. Alvord of the latter station. About 30 pounds of soil were contained in each sample sent to us, which represented the surface soils of the respective stations to a depth of 9 inches. A corresponding sample was taken of our own station soil. The samples were each pulverized, but not sifted, and laid very thinly upon boards exposed to the sun for several days until they were thoroughly sun dried. When quite dry, smaller samples were taken from each of the original ones and put into zink forms made for the purpose. The "forms" or vessels were 9 inches deep by 2 inches square. The bottoms were finely perforated, and before putting the soil into them square pieces of linen were damped and laid at the bottom inside in order to prevent any particles dropping through the perforations made for the capillary passage of water. When completed and filled with soil, care being taken that the latter should not be too loose or too compressed in the vessels, the latter were placed in a tub containing water one-half inch deep for twenty-four hours, or until each sample had taken up its maximum quantity of water. The sun-dried soils, with the vessels, were weighed before being put into the tub and immediately after being taken out, any drops attaching to the vessels being wiped off. The quantity of water taken up, or the absorptive power (by capillarity) of each soil, was thus determined.

Having thus come at the absorptive power of each soil, the next step was to determine the relative power of the soils to retain the water they had taken up under the same conditions.

A double series of vessels and samples of each soil were used, one part of which were placed under a normal exposure, *i. e.*, the vessels were put out in the field and

exposed to every change of weather, day and night, whilst the second part were kept in the barn, and thus kept from the sun and any rainfall. The data observed in the experiments are expressed in the following tables:

I.—TABLE SHOWING THE RELATIVE ABSORPTIVE POWERS OF THE SOILS.

Sample of soil.		Dry weight of soil.	Weight after immersion.	Weight of water absorbed.	Own weight of dry soil.
		Grams.	*Grams.*	*Grams.*	*Per cent.*
Maryland,	I	1,344	1,702	358	26.6
	II	1,414	1,777	363	25.6
Indiana,	III	1,409	1,795	386	27.3
	IV	1,426	1,818	392	27.4
Station,	V	1,304	1,735	431	33
	VI	1,330	1,868	438	32.9

II.—TABLES SHOWING THE RELATIVE RETENTIVE POWERS OF THE SOILS.

(a) Series of samples placed in the barn.

Samples of soils.	Per cent of water, of own weight of the samples, in the soils on—							
	July 13.	July 20.	July 27.	Aug. 3.	Aug. 10.	Aug. 17.	Aug. 24.	Aug. 31.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Maryland, No. I	26.6	25.4	17.7	16.1	13.4	11.3	9.8	8.1
Indiana, No. III	27.3	23.4	20	18.5	15.6	13.7	12.2	10.6
Station, No. V	33	26.6	22.5	20.4	16.8	14.2	12.2	12.5

(b) Series of samples placed in normal exposure.

Samples of soil.	Per cent of water, of own weight of the samples, in the soils on—							
	July 13.	July 20.	July 27.	Aug. 3.	Aug. 10.	Aug. 17.	Aug. 24.	Aug. 31.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Maryland, No. I	25.6	10.5	14.4	9.0	7.2	7.9	8.9	7.8
Indiana, No. IV	27.4	14.3	18.2	12.5	9	9.6	12.2	10.4
Station, VI	32.9	16.3	20	14.9	10.3	10.8	21.5	20

If the results of the station samples are taken as expressing 100, the relative capillary and retentive powers are as follows, based upon the data observed on August 31:

Soils.	Capillary or absorptive power.	Retentive power (in the shade).	Retentive power (normal exposure).
Station soil	100.0	100.0	100.0
Indiana	82.7	84.2	52.0
Maryland	78.7	64.8	39.0

Table I shows the great resorbtive power of the station soil, which means its great capillarity, as the moisture was taken up by capillary action.

Table II, series (*a*), indicates certain very important facts in the station soil, viz: First, that a portion of the very high per cent of water taken up by absorption is very rapidly given off, after which the rate of evaporation continues very gradual down to 12.2 per cent, when, on reaching that minimum, it commences reabsorbing

moisture from the air, whilst the Indiana and Maryland soils continue to lose in weight.

Series (*b*), of Table II, where the soils were placed in normal exposure, similar results are observed. The per cent of moisture in the station soil is constantly higher than in the other soils, and toward the end of August, when the Maryland and Indiana soils had become practicably insensible, the station soil was still highly sensitive in taking up and in retaining the moisture which it had received, as is shown by the data tabulated on August 31.

The data set forth in the tables illustrate the striking adaptability of the Nebraska soils to the Nebraska climate. They show the peculiar capability of those soils to withstand the usually bad effects of an excess of either rain or drought. They further indicate that, should the strong winds exercise an influence disturbing to the balance of the other climatic conditions, temperature, and rainfall, that influence appears to be effectually neutralized by the signal properties of the soil.

The "thinning out," it was said, commenced May 26. The plants were taken when they had four well-developed leaves. It appears very undesirable to disturb the young plantlets until they have reached the size stated. The rootlets have too frail a hold of the ground, and premature disturbance may more or less detach the plantlet from its soil connection.

The laborers employed were chiefly men who had never seen a beet field. Occasionally an old workman came who as a lad had been in the beet fields of Germany or Bohemia. The thinning out of the beets is the most particular operation of the cultural season, and with such laborers the work not only proceeded very slowly, but it was only possible at the beginning under constant practical supervision. Each man had to be shown, and repeatedly shown, until he could observe all the small points in the work. Small hoes with 3-inch blades were used, but the nervousness of the men, fearing they would not be able to manage the strokes, caused them at first to rely too much upon their hands.

In the hands of expert workmen the hoe not only enables more work to be done, but the work is done better. Not merely is the ground removed around and between the plants which are left, but the actual separation of the plants thinned out from the plants left is done with less damage to the latter when the hoe is used. A skillful workman will separate a bunch of plants better with the hoe than with the hand, excepting where there are very many small plants together. He will quickly with his practiced eye and hand separate the *best plant*, and by a manipulation of the hoe, slightly press the soil about it, and in the same act cut out the surplus plants, and in such a way that the standing plant remains even more firmly in its place than before. Such skillfulness requires much practice to acquire. Thinning out with the hand is apt to do more damage to the standing plants unless one hand is used to hold the standing plant, while the surplus plants are pulled out with the other hand; but that is an endless method. The ultimate form of the beet, and possibly other conditions, are directly affected by the act of thinning out. If the plants which are to stand are disturbed by the removal of the surplus plants so that the tap-root is severed from the soil at the point of the root, by which act the root-cap may also be injured or separated from the root, then instead of developing one tap-root with a system of very minute, fine, and fibrous root growth, several prongs will be put out and the form of the beet is wholly distorted. For example: Ten plants were drawn out of the soil with great care, and without apparently leaving any portion of the root in the ground. Those plants were replanted and grew to average sized beets. Each one of the ten beets, however, developed no tap-root, but instead several prongs or fingers, varying from two to five in number, and the natural form of each beet was distorted.

The "thinning out" of Fields B and A, the first time over, was finished June 11. On June 2, a strong rain fell, which brought away the seed still lying in the ground very

rapidly on account of the high temperature of the soil. The plants grew very quickly and the "thinning out" of all the plats, including the small experimental plats, was completed June 18.

The growth of the beets after the rain of June 2 and following days was phenomenal. This rapid growth, and the heavy and frequent rains, made the further acts of cultivation very difficult to do. In Field B the rows were only 17 inches apart, and the plants from the second period of germination being so far behind the early plants it was not practicable for the use of the horse hoe. The beets were hoed twice over after the final "thinning out," including the whole space between the rows and around the plants, and any "double plants" were separated. This work continued up to July 6, when the beets were "rowed up," that operation being done with the broad-blade hoes, the soil being hoed up on each side of the beets level with the top of the neck of the same. In that form, the beets hidden in soil and a trench made between the rows, the work was ended. In Field A, where the rows were 18 inches apart, horse labor was used in the light cultivation. After the thinning out, the horse hoe was used three times over, at such periods when the rains allowed. The beets were hoed twice with hand hoe amongst the plants and finally hoed up, the same as in Field B.

The cultivation of the small experiment plats was conducted in a way similar to what has been described. On those plats the seed came up thick and evenly. There was a full plant. The plants were thinned out exactly 6 inches apart in the rows, the distances being regulated by a 6-inch measure which the man carried for the purpose, the whole work on those plats being done by one skilled man. The plants were left about 6 inches apart in the rows on the large plats, but the same degree of exactness was not attained as upon the small plats. Further hoeing twice over and the final hoeing up completed the work on the small plats.

July 12 the cultural work of the season was done. The beets covered the whole ground, and, as far as cultivation could exercise an effect, there was no obstacle in the way of their progress.

The crop was now left to the climatic conditions, as it was advanced beyond reach of danger from other sources. And it will be in place here to observe the abnormal conditions of weather extending over the cultural season. It has been seen that little rain fell during the whole month of May, and normally the latter half of that month receives the usual spring rains, which continue into early June, and which are in the highest degree favorable to the cultural season of that period. On June 2 the first good rain fell since early in April. When the rains began they fell in torrents. In the month of June 12 inches were recorded, or nearly half an inch daily. On the 24th and 25th 8 inches fell in thirty-two hours. On the latter date the beets were not visible, the water standing from 6 to 8 inches deep over the whole tract of Field A. No immediate damage occurred to the crop, but the continuous dull weather, with a high atmospheric humidity (78.7 for June), frequent rains, and comparatively little sun, which conditions continued through July, caused eventually an unfavorable appearance. On July 25 it was observed that in the lower parts of the plats, where the deep green of the leaves had gone over into a sickly brown-yellow, the beets had commenced rotting. The decay commenced at the neck, on account of the moisture which was constantly resting on the foliage, for it was seldom dry. The decaying continued until the first week of August, when a period of dry weather, with hot winds, set in and saved the further damage of the crop. The decayed beets were dug up as soon as they were detected, but others which had merely commenced rotting recovered and put forth a second growth of foliage. The sugar content of those beets, however, remained abnormally low.

A table of the rainfall and temperature for May, June, July, August, September, and October is given, expressed in weekly means:

Date.	May.		June.		July.		August.		September.		October.	
	Rain.	Temp.	Rain.	Temp.	Rain.	Temp.	Rain.	Temp.	Rain.	Temp.	Rain.	Temp.
	In.	°	*In.*	°	*In.*	°	*In.*	°	*In.*	°	*In.*	°
First week	0.14	50.8	2.65	61.8	3.16	67.7	......	76.0	......	62.4	3.25	43.6
Second week	0.02	62.2	1.04	69.8	0.20	69.9	0.60	73.1	0.27	64.5	0.52	48.8
Third week	0.77	60.8	0.21	69.1	1.47	72.7	1.54	68.3	......	74.0	0.15	51.5
Fourth week	0.45	62.4	7.64	73.6	1.88	69.4	0.08	63.3	0 57	59.7	......	46.4
Mean rain	1.38	....	11.54	....	6.71	....	2.22	....	0.84	....	3.92	....
Mean temperature	......	59.0	......	68.4	......	69.9	......	70.2	......	65.1	......	47.6

Total rainfall for the given six months .... inches.. 26.61
Normal rainfall (for northern Nebraska) six months .... do.... 12.49
Total units of heat for the given six months 11,651
Normal units (for northern Nebraska) six months 11,518

The total heat units for the given six months are almost identical with the normal quantity found for northern Nebraska. The distribution, however, as we have in another place shown, was very far from the normal; May and September being several degrees too warm, and July, even in a greater degree, too cold.

ANALYTICAL SEASON.

The work of testing the beets analytically, in order to learn the results of the cultural season, opened early in September.

The station laboratory was completed and ready for use September 10.

The analytical work of the laboratory was conducted by T. C. Trescot, U. S. Department of Agriculture, assisted by C. B. Edson and others.

September 12 a general view of the crop was taken, expressed by the mean of several analyses of beets from each field, with the following results:

	Sucrose in juice.	Purity.
	Per cent.	
Field A	12.8	77.1
Field B	14.3	82.0

September 14 and 15 each of the six varieties in Field B was examined, and the mean of ten analyses of each variety gave as follows:

Variety.	Sucrose in juice.	Purity.
	Per cent.	
Elite	14.6	82.0
Knauer	15.7	80.2
Lemaire	13.2	77.0
Desprez	13.8	81.3
Vilmorin	14.3	....
Kleinwanzlebener	14.7	....

It is seen from the polariscope readings that the sugar present in the juice was very satisfactory. The juices, however, still appeared "green," and the general appearance indicated that, if the sucrose were approaching its maximum, there was room for improvement in the condition of the juices. The beets, moreover, had not fully taken on the mellow, golden-green color of the leaves indicative of maturity.

Analyses were made with ten beets selected from No. 1, small plat, on September 15, the mean of which gave 13.8 per cent sucrose in the juice.

No further work was done in the laboratory for another week, it appearing desirable to leave the beets alone, as they were gradually improving.

September 21 work commenced again in Field B, and upon a large scale. The beets of certain varieties appeared to have reached a state of maturity which made it possible to arrive at conclusions concerning the actual results of those varieties

expressed in weight per acre, the content of sucrose in the juice, and the total yield of sugar per acre, which data form the ultimate purpose and end of the work.

The work of determining the weight of beets per acre was done by selecting a given number of 3 square rods, according to the size of the whole plat, and ascertaining the weight of each square rod from the several parts of the plat and taking the mean as representing the 160-part of an acre. The details of selecting the square rods and the weighing of the beets were as follows: A wooden square made of light wood, was dropped down upon the place selected. That frame inclosed exactly 1 square rod. Every beet was taken up inside the square and none outside, so that each measurement was essentially precise. The beets were thoroughly cleaned; the tops, including the neck, were cut off with any coarse lateral roots, and weighed immediately. As already said, the mean of the square rods thus weighed upon each plat was taken as the acre unit.

The method of sampling a plat for determining the per cent of sucrose in the juice and the yield of sugar per acre was as follows: The length of the plats in Field B was between 30 and 40 rods, consequently the breadth of the plats was very small and the number of rows of beets few. Where the number of rows to a plat was less than 20 one average row was selected, and where the number exceeded 20 to the plat two average rows were selected. The selected rows were taken up in the following order: Either one hundred or two hundred beets, as decided upon, were selected in *twenties* from either five or ten different places in the rows, the places being so far apart as to give an actual average of the beets in the rows. Those beets were taken immediately to the laboratory and analyzed. Each one of those two hundred beets was analyzed individually, in order to afford not only an average, but also to observe the scale of variation in weight and sugar content of the single beets. In the next place, the whole of the beets remaining in the selected rows were taken up and brought direct to the laboratory and analyzed in "tens," *i. e.*, the juice of ten beets already weighed and ground up, was expressed and one polariscope reading made. From the individual beets the weight and sugar content of each one were found; and from the beets analyzed in *tens* the average weight, sugar content, and purity were obtained. The number of beets analyzed daily was from one hundred upwards, even to nine hundred daily, where the work was done in tens.

The weight of beets per acre (the samples being prepared for the scales in the manner already described) of the several varieties was as follows:

Field B.

Variety.	Date.	Pounds per square rod (mean of 3 square rods).	Pounds per acre.	*Tons per acre.
Elite	Sept. 21	257.0	41,120	20.56
Knauer	Sept. 23	266.0	42,560	21.28
Lemaire	Sept. 24	293.2	46,912	23.49
Desprez	Oct. 6	330.3	52,848	26.42
Vilmorin	Oct. 7	322.2	51,552	25.80
Kleinwanzlebener	Oct. 8	307.5	49,200	24.60

*All tons = 2,000 pounds.

Field A.

Variety.	Date.	Pounds per square rod (mean of 3 square rods).	Pounds per acre.	Tons per acre.
Elite	Oct. 13	226.3	36,240	18.10
Knauer	Oct. 13	220.8	35,328	17.7
Lemaire	Oct. 15	229.7	36,750	18.4
Desprez	Oct. 15	266.3	42,608	21.3
Vilmorin	Oct. 19	263.3	42,128	21.1
Kleinwanzlebener	Oct. 19	281.0	44,960	22.5

The varieties "Elite" and "Knauer," in Field B, which were weighed first, and which were also the first to be tested on a large scale in the laboratory, appeared to have reached their maximum maturity. The Lemaire variety in the same field did not appear so thoroughly ripe, and the other varieties were still further off. Consequently, after September 24 the beets were left alone until October 6, no weighings or analyses being made during that interval.

The varieties in Field A were quite mature at the time the weighings were made.

The weighings given represent the maximum yield per acre of each of the varieties in both fields. The utmost precision was observed in each operation, and the results are given as being exact. Moreover the weighings were practically confirmed by the number of tons actually hauled from the fields when the whole of the beets were gotten up.

The analytical work, commencing September 21, began in Field B on the variety "Elite." The plat of that variety was comparatively small, so that 100 beets were analyzed individually and 800 in "tens," making 900 beets totally that were taken to represent the sugar value of the variety. The analytical data of the "individuals" are given in Table I. No selection of the beets was made, each one being taken seriatim in the row. The mean of analysis of 100 beets was 15.6 per cent of sugar in the juice. The data obtained from the analysis of the 800 beets in "tens" are given in Table II.

The results of the analyses of the "Elite" variety, September 21, were: Mean sucrose in juice, 15.7 per cent; mean purity, 84.6 per cent. The variety analyzed next in order was the "Knauer." From that variety 100 "individuals" and 620 in "tens" were analyzed. The mean percentage of sucrose in the juice of the 100 beets analyzed separately was 15.7. (The full table is omitted to economize space.)

The analyses of the 620 beets in "tens" are given in Table III.

The results of the "Knauer" variety, September 22, were: Mean sucrose in juice, 15.4 per cent; mean purity, 84.9.

September 25 the "Lemaire" variety was examined; 100 beets were taken for individual analysis and 600 for analyzing in "tens."

The 100 "individuals" gave the following results: The mean percentage of sucrose in the juice of the 100 separate beets was 13.9.

The 600 in "tens" gave the results recorded in Table IV.

The average results of the two sets of analyses the "Lemaire" variety on September 25 and 26 were: Mean sucrose in juice, 13.8 per cent; mean purity, 81.2 per cent. The "Lemaire" beets were not so mature as those of the "Elite" and "Knauer" varieties, and as the condition of the remaining varieties appeared still further from maturity no further analytical work was done until October 6. The weather of the previous ten or fourteen days had been highly favorable, and the less matured varieties were still improving.

From the cessation of the analytical work on September 26 up to the recommencement of the same, heavy rains fell. About 4 inches of rain were registered during that interval, an abnormally heavy precipitation for that season. The normal rainfall for October in that part of the State is very little more than 1 inch. Following the period of hot weather (the twelve days from September 13 to 25, the mean of the daily maximum temperature was precisely 90°), and falling upon soil whose temperature was over 70°, the effects were likely to be unfavorable and perhaps disastrous.

October 6 work was resumed in Field B, and upon the "Desprez" variety; 200 beets were analyzed individually, and the mean result of the analyses was: Sucrose in the juice, 13.5 per cent.

At the time (October 6) stated no beets of the Desprez variety were analyzed in "tens."

October 8 the Vilmorin variety was further examined, 200 beets being analyzed individually, showing a mean percentage of sugar of 13.8,

October 10 the Kleinwanzlebener variety was tested. One hundred beets were analyzed as "individuals," and the mean results showed 14.7 per cent of sugar.

A notable effect of the heavy rains and previous hot weather is observable in the sucrose readings of the last three varieties of beets analyzed. The falling off in the sucrose was seen by comparing the readings on the given dates.

Variety.	Sucrose, Sept. 15.	Sucrose, Oct. 10.
	Per cent.	*Per cent.*
Desprez	13.8	13.5
Vilmorin	14.3	13.8
Kleinwanzlebener	14.7	14.7

Analyses of those varieties were not made immediately before the rains, *i. e.*, about September 26; otherwise, if a comparison were made with the "Elite" and "Knauer" varieties, and it be supposed that the three former had made a similar increase in sucrose that the two latter varieties had done between September 15 and 25, then the actual falling off in sucrose in consequence of the rains would be much greater, which doubtless was the case.

Field B was left alone after the work already described, a sufficient number of beets of each variety being left for further analytical examination at a later period in the season, in order to observe whether any of, or all, the varieties recovered the loss in sucrose before the season closed.

October 13 an examination of the varieties upon a large scale commenced in Field A. The work was conducted the same as in Field B, and does not require any further comment.

Variety "Elite," 100 beets were analyzed as "individuals," and 200 were tested in "tens." The mean results of the individual analyses showed 14.8 per cent of sugar.

The 200 beets analyzed in "tens" gave the results recorded in Table V.

The mean results of the analyses of the "Elite" variety, October 13, were: Mean sucrose in juice, 14.5 per cent; mean purity, 84.6 per cent.

October 14 the "Knauer" variety was tested. The mean result of the analysis of 100 individuals gave 14.8 per cent of sucrose in juice.

The results of the analyses of 200 beets in "tens" are recorded in Table VI.

The mean results of the two sets of analyses of the "Knauer" variety, October 14, were: Mean sucrose in juice, 14.8 per cent; mean purity, 88 per cent.

October 15 the "Lemaire" variety was examined.

One hundred "individuals" were analyzed separately, showing mean sucrose in juice, 14.2 per cent.

Two hundred beets were analyzed in sets of "tens," and the results are shown in Table VII.

The mean results of the two sets of analyses of the "Lemaire" variety, October 15, were: Mean sucrose in juice, 14.1 per cent; mean purity, 83.5 per cent.

October 16 the "Desprez" variety was analyzed.

One hundred beets analyzed "individually" gave the following mean result: Sucrose in juice, 14.8 per cent.

Two hundred beets analyzed in "tens" gave the results recorded in Table VIII.

The average results of the two sets of analyses of the Desprez variety October 16 were: Mean sucrose in juice, 14.4 per cent; mean purity, 84.6 per cent.

October 17 the Vilmorin variety was examined. One hundred beets analyzed separately gave the following mean result: Per cent sucrose in juice, 14.8.

Two hundred of the same variety analyzed in "tens" gave the results recorded in Table IX.

The average results of the two sets of analyses of the Vilmorin variety, October 17, were: Mean sucrose in juice, 14.6 per cent; mean purity, 84.9 per cent.

October 19 the Kleinwanzlebener variety was examined. One hundred "individuals" were analyzed and gave the following mean results: Per cent sucrose in the juice, 14.8 per cent.

Two hundred beets of the same variety, analyzed in "tens," gave the results recorded in Table X.

The average results of the Kleinwanzlebener variety October 19 were: Mean sucrose in juice, 14.5 per cent; mean purity, 82.8 per cent.

The analysis of each variety in both fields upon a very broad scale set forth the condition of the beets and the sugar value of the crop at the stated periods. The analysis, when put in comparison with the examinations made in September, show the action of the climatic conditions—the falling off of the sucrose in consequence of the rains, and the comparative capabilities of the varieties to recover their lost sucrose value.

The varieties in each field were gone over again and their condition determined after an interval of fourteen days. The examination recommenced in Field B. The "Elite" and "Knauer" varieties were not examined further, as they had attained full maturity and their maximum values were ascertained before the rains set in. The varieties "Lemaire," "Desprez," "Vilmorin," and "Kleinwanzlebener" remained in the ground in sufficient number to allow of a further thorough examination of their condition.

The purpose of the repeated analyses of the varieties at the given intervals was, in the first place, to observe the approach of each toward maturity and to determine the precise period when each variety had attained its maximum value, and, further, to note the specific effect of the great heat, followed by the rains, by observing the degree of the sucrose depreciation consequent on the "second growth" and to what extent the beets recovered their loss in sugar.

October 20 the "Lemaire" variety was reëxamined. One hundred "individuals" gave the following mean results: Sucrose in juice, 14.1 per cent. Eighty beets, in "tens," gave the results recorded in Table XI.

The average results of the "Lemaire" variety, October 20, were: Mean sucrose in juice, 14.6 per cent; mean purity, 88.5 per cent.

October 21 the "Desprez" variety was retested. One hundred "individuals" gave the following mean result: Sucrose in juice, 14.1 per cent. (See Table XII.)

Three hundred and eighty beets in "tens" gave results recorded in Table XII *bis*.

The average results of the "Desprez" variety, October 21, were: Mean sucrose in juice, 14.1 per cent; mean purity, 87.7 per cent.

October 22 the Vilmorin variety was reëxamined. Fifty "individuals" were analyzed and gave the following mean results: Sucrose in juice, 12.8 per cent.

Six hundred and sixty beets of the same variety, analyzed in "tens," gave the results recorded in Table XIII.

The average results of the Vilmorin variety, October 22, were: mean sucrose in juice, 13.4 per cent; mean purity, 85.8 per cent.

October 23 the Kleinwanzlebener variety was reëxamined. Fifty "individuals" analyzed gave the following mean results: sucrose in juice, 14.1 per cent.

Six hundred and twenty beets, analyzed in "tens," gave results recorded in Table XIV.

The average results of the Klein-Wanzleben variety, October 23, were: mean sucrose in juice, 14.1 per cent; mean purity, 83.8 per cent.

On completing the reëxamination of the varieties in Field B, the work of the following week was given to a complete investigation of the condition and results of the experiments on the small plats. It will be convenient, however, to bring in at this period the data obtained from the reëxamination of the varieties in Field A, in order that the observations upon the large plats in Fields A and B mav be brought to a conclusion.

The reëxamination of the varieties n Field A commenced October 31, and in the following order:

October 31 the "Elite" variety was analyzed and gave the following data:

Two hundred beets were analyzed in "tens," and the results are recorded in Table XV.

The average results of the analyses of the Elite variety, October 31, were: mean sucrose in juice, 14.2 per cent; mean purity, 83.9 per cent.

November 2 the "Knauer" variety was reëxamined. Two hundred beets, analyzed in "tens," gave the results recorded in Table XVI.

The average results of the analyses of the "Knauer" variety, November 2, were: mean sucrose in juice, 13.2 per cent; mean purity, 82.1 per cent.

November 2, the "Lemaire" variety was reëxamined; two hundred beets were analysed in "tens," and gave the results recorded in Table XVII.

The mean results of the analyses of the "Lemaire" variety, November 2, were: mean sucrose in juice, 12.6 per cent; mean purity, 80.0 per cent.

November 2, the "Desprez" variety was reëxamined. Two hundred beets were analysed in "tens," and gave the results recorded in Table XVIII.

The average results of the analyses of the "Desprez" variety, November 2, were: mean sucrose in juice, 12.6 per cent; mean purity, 80.9 per cent.

November 2, the Vilmorin variety was reëxamined. Two hundred beets, analysed in "tens," gave the results recorded in Table XIX.

The average results of the analyses of the "Vilmorin" variety, November 2, were: mean sucrose in juice, 13.1 per cent; mean purity, 83.6 per cent.

November 2, the "Kleinwanzlebener" variety was reëxamined. Two hundred beets were analysed in "tens," and gave the results recorded in Table XX.

The mean results of the analyses of the "Kleinwanzlebener" variety, November 2, were: mean sucrose in juice, 13.0 per cent; mean purity, 79.7 per cent.

The per cent of sucrose in the juice and the purity of the several varieties at the different periods are shown in the following résumé:

Field B.

Variety.	Date.	Sucrose in juice.	Purity.
		Per cent.	
Elite	Sept. 15	14.6	82.0
	Sept. 21	15.7	84.6
Knauer	Sept. 15	15.7	80.2
	Sept. 22	15.4	84.9
Lemaire	Sept. 15	13.2	77.0
	Sept. 26	13.8	81.2
	Oct. 20	14.6	88.5
Desprez	Sept. 15	13.8	81.3
	Oct. 6	13.5	....
	Oct. 21	14.1	87.7
Vilmorin	Sept. 15	14.3	....
	Oct. 8	13.8	....
	Oct. 22	13.4	85.8
Kleinwanzlebener	Sept. 15	14.7	....
	Oct. 10	14.7	....
	Oct. 23	14.1	83.8

Field A.

Variety.	Date.	Sucrose in juice.	Purity.
		Per cent.	
Elite	Sept. 12	12.6	75.9
	Oct. 13	14.5	84.6
	Oct. 31	14.2	83.9
Knauer	Sept. 12	11.5	75.7
	Oct. 14	14.8	88.0
	Nov. 2	13.2	82.1
Lemaire	Sept. 12	11.5	77.2
	Oct. 15	14.1	83.5
	Nov. 2	12.6	80.0
Desprez	Sept. 12	13.2	76.7
	Oct. 16	14.4	84.6
	Nov. 2	12.6	80.9
Vilmorin	Sept. 12	13.1	76.3
	Oct. 17	14.6	84.9
	Nov. 2	13.1	83.6
Kleinwanzlebener	Sept. 12	13.6	77.7
	Oct. 19	14.5	82.8
	Nov. 2	13.0	79.7

The observations attaching to the varieties in Field B show that the "Lemaire" and "Desprez" varieties made improvement in October after the bad effects of the rains had abated. The "Vilmorin" and "Kleinwanzlebener" varieties, which were nearer maturity than the two former varieties at the time that the rains fell, never recovered their lost ground, but continued to fall off in sucrose. The weather, however, was very unfavorable to a recovery from the effects of the "second growth" consequent on the rains. Although there was very little rain after the first week in October, the weather was ungenial. The nights were frosty and the days very changeable and raw, and not in any degree favorable to a gradual maturity of the beets, if considered in comparison with the general tone of the fall weather in the beet districts of Europe.

In Field A, no analytical data was obtained immediately before nor immediately after the rains, but the table indicates clearly the period in October when the varieties had reached their maximum value, and that later there was a notable falling off both in the sugar content and the purity of the juices, or, in other words, the beets were at the best for sugar-making purposes in the first half of October, and that by the end of the month they had fallen off in value for the factor not less than 15 per cent considering the decreased purity of the juices in connection with the actual loss of sucrose in the beets.

If an analysis of the respective behaviors of the varieties be attempted any very conclusive data can hardly be established; nevertheless it is observed in Field B that the "Elite" and "Knauer" varieties came first to maturity. Again, in respect of the property to resist and recover from the unfavorable climatic conditions, the "Lemaire" and "Desprez" varieties appeared to excel the "Vilmorin" and "Kleinwanzlebener" varieties; but, as it has already been said, that difference in favor of the two former varieties might be wholly owing to their being farther from maturity at the time that the rains fell. In Field A, the behavior of the varieties was so very uniform that there is not room for safe comment in favor of any one.

More exact conclusions may be established of the actual values of the varieties by comparing the weight per acre with the sugar contained in the beets of each variety. In doing that the highest average sucrose reading will be used with the weight per acre in order that the maximum value expressed in the yield of sugar per acre may be given. The following tables set forth the comparative values of the varieties:

Field B.

Variety.	Weight per acre.	Sucrose in beets.	Sugar per acre.
	Tons.	*Per cent.*	*Pounds.*
Elite	20.56	14.9	6,126
Knauer	21.28	14.9	6,341
Lemaire	23.49	13.8	6,473
Desprez	26.40	13.4	7,081
Vilmorin	25.80	13.6	6,959
Kleinwanzlebener	24.60	13.9	6,838

Field A.

Variety.	Weight per acre.	Sucrose in beets.	Sugar per acre.
	Tons.	*Per cent.*	*Pounds.*
Elite	18.1	13.8	5,001
Knauer	17.7	14.0	4,945
Lemaire	18.4	13.4	4,924
Desprez	21.3	13.7	5,837
Vilmorin	21.1	13.9	5,855
Kleinwanzlebener	22.5	13.8	6,204

In order to come at the volume and value of production of the respective varieties this season, and to obtain an indication of the comparative value and adaptability of the varieties to the soil and climate in which they have been grown, the mean of each variety in field A and field B will be given, expressed in the weight of beets per acre, the sugar per acre, and the purity of the juices, from which collective data a precise estimate may be formed of the value of each variety, both to the grower of the beets and the manufacturer of the sugar.

Mean of field A and field B.

Variety.	Weight per acre.	Sugar per acre.	Purity of juices.
	Tons.	*Pounds.*	
Elite	19.33	5,564	84.6
Knauer	19.49	5,613	86.4
Lemaire	20.94	5,698	86.0
Desprez	23.85	6,459	86.2
Vilmorin	23.45	6,407	85.4
Kleinwanzlebener	23.55	6,521	83.3

The analysis of the varieties does not require further comment. The almost identical values of the "Kleinwanzlebener," "Desprez," and "Vilmorin" varieties are very notable. The other varieties form a second class in respect of the actual money value per acre.

It may be of interest to add a comparison of the results obtained by the Department beet station with those of a station in Europe, where the work is conducted with the same care and accuracy. The Chapelle agricultural station, France, affords the data for such a comparison published in the official bulletins of this year. The data of the Chapelle station represent the mean condition and results of several experimental plats at the several periods stated, and the statement of the Department station gives the mean condition of all the varieties and plats at almost corresponding periods in the season at Schuyler.

Stations.	Date.	Weight of beets per acre.	Sugar per acre.
		Tons.	*Pounds.*
Chapelle (France)	Sept. 9	11.35	3,014
	Oct. 7	14.86	4,182
	Nov. 18	16.30	4,919
Schuyler (Nebr.)	Sept. 15	21.77	5,790
	Oct. 15	21.77	6,060
	Nov. 2	21.77	5,398

The exact weight of each plat on the Schuyler station was not obtained upon all the dates given, but certain plats were weighed September 12 and 15 and October 26, and the weight of beets per acre was found to be constant. The sugar content on September 15 indicated that the maximum growth had been attained, although there was room for improvement in the state of maturity of the juices.

A comparison of the data given of the two stations suggests the dissimilar climatic conditions attending the maturing season in the respective countries. In France the beets mature slowly and late into the fall. In Nebraska the season is early, prompt, and sooner over.

SMALL PLATS.

The results of the experiments conducted upon the small plats will now be examined.

It was explained in the early part of the report that those experiments consisted of three series, having the following purposes:

(1) The determination of the distances that the beets should be planted apart from each other in order to obtain the maximum production, expressed in weight of beets and sugar per acre.

(2) The observing of the effects (if any) of varying quantities of phosphate fertilizers upon the yield of beets and sucrose.

(3) To indicate the time when it may be most advisable to plant the beet seed in the conditions which obtain in the district where the station is located.

It must be previously observed that the analytical work upon an exhaustive scale was not commenced upon those small plats until a week after the beets were at their best. As a consequence the total value of the results of the plats as indicated by the content of sucrose present in the juices will appear low, and it is certain that the sucrose in the juices of all the plats, excepting Nos. 14 and 15, was lower by 1 per cent at the time of analyzing than it was a week before. The plats Nos. 14 and 15 were very late in maturing, not having been planted until June.

FIRST SERIES.

The weight of beets per acre of each plat will first be given. The beets on each plat were planted exactly 6 inches apart in the rows. The distance between the rows was different upon each plat, thus showing a varying scale of the number of beets to the acre.

Plat.	Distance between rows.	Number of beets per acre.	Weight per square rod.	Weight per acre.
	Inches.		*Pounds.*	*Tons.*
No. 1	12	87,137	300	24
2	14	74,674	252	20.2
3	16	65,340	219	17.5
4	18	58,080	198	15.8
5	20	52,272	190	15.4
6	22	47,520	175.5	14

The sugar content of the juices of the plats is given in the following tables:

Plat No. 1.—Sixty beets were analyzed individually and gave the following mean results: Per cent sucrose in juice, 13.8.

Sixty beets analyzed in "tens" gave the results recorded in Table XXI.

The average results of the analyses No. 1 Plat were: Mean sucrose in juice, 13.7 per cent; mean purity, 80.8 per cent.

Plat No. 2.—Sixty individuals analyzed the following mean result: Sucrose in juice, 13.1 per cent.

Sixty beets analyzed in "tens" gave results recorded in Table XXII.

The average results of the analyses of No. 2 Plat: Mean sucrose in juice,13.1 per cent; mean purity, 82.7 per cent.

Plat No. 3.—Sixty individuals analysed gave the following mean results: Sucrose in juice, 14 per cent.

Sixty beets analyzed in "tens" gave results recorded in Table XXIII.

The mean results of the analyses of No. 3 Plat were: Mean sucrose in juice, 13.5 per cent; mean purity 80.9 per cent.

Plat No 4.—Sixty individuals analyzed separately gave the following mean result: Sucrose in juice, 13 per cent.

Sixty beets analyzed in "tens" gave the results recorded in Table XXIV.

The mean results of the analyses of No. 4 Plat were: Mean sucrose in juice,12.9 per cent; mean purity, 80 per cent.

Plat No. 5.—Sixty individuals analyzed separately gave the following mean result: Sucrose in juice, 13.5 per cent.

Sixty beets analyzed in "tens" gave the results recorded in Table XXV.

The average results of the analyses of No. 5 Plat were: Mean sucrose in juice, 13.0 per cent; mean purity, 77.7 per cent.

Plat No. 6.—Sixty "individuals" analyzed separately gave the following mean result: Sucrose in juice, 12.8 per cent.

Sixty beets analysed in "tens" gave the results recorded in Table XXVI.

The average results of the analyses of No. 6 Plat were: Mean sucrose in juice, 12.9 per cent; mean purity, 80.5 per cent.

The value per acre of each of the plats, expressed in weight of beets and sugar per acre, was as follows:

Plat.	Distance between the rows.	Weight of beets per acre.	Sugar per acre.
	Inches.	*Tons.*	*Pounds.*
No. 1	12	24.0	6,240
2	14	20.2	5,009
3	16	17.5	4,480
4	18	15.8	3,855
5	20	15.4	3,788
6	22	14.0	3,416

It must be said, by way of comment upon the comparatively low weights per acre of the beets, that the small plats suffered the most excessive effects of the heavy rains of June and July because of the ground lying lower than the large plats near by. Moreover, the rows ran from east to west instead of from north to south (the form of the plats made the other direction impracticable), and that was specially disadvantageous in the wet season.

It was observed that the individual beets were very little larger on the plats where the rows were 22 inches apart than on the plats where the rows were only 12 inches distant from each other. The beets in the rows, however, were planted only 6 inches apart on all the plats, and that circumstance controlled the comparative uniformity of the size of the beets throughout, the distance between the plants in the row being a more important factor than the distance between the rows in deciding the size of the beet.

SECOND SERIES.

The five following plats were devoted to observing the effect of phosphorous fertilizers upon the production of weight of beets and sugar per acre.

The fertilizer experimented with was a slag phosphate. The application of the fertilizer was at the time of planting the seed. The results may serve to indicate that those soils do not require any aid from artificial fertilizing agents.

The results will be given in brief in the following table:

Plats.	Fertilizer per acre.	Weight of beets per acre.	Sugar per acre.
	Pounds.	*Tons.*	*Pounds.*
No. 7	160	16.3	4,192
8	240	16.7	4,141
9	320	15.6	3,900
10	480	15.4	3,942
11	640	14.5	3,699
0	(*)	15.8	3,855

* Nonfertilized plat.

THIRD SERIES.

The following four plats were used for the purpose of observing the results obtained from beets planted at different periods.

The plats Nos. 14 and 15 did not suffer so much from the heavy rains; otherwise the conditions were equal. The results are given in brief in the following table:

Plat.	Date of planting.	Weight of beet per acre.	Sugar per acre.
		Tons.	*Pounds.*
No. 12	May 12	14.1	3,750
13	May 19	13.2	3,616
14	May 26	14.9	3,993
15	June 2	12.5	3,450

During the analytical season experiments were conducted for the purpose of ascertaining—

(1) The loss of weight in the beets from evaporation when exposed for varying lengths of time.

(2) The action upon the sucrose contained in the beet when the latter is removed from its connection with the soil.

It has been claimed that when beets are taken up out of the soil and stored a further increase of sucrose takes place in the organism, and more lately it has been stated that if the beets are disturbed by an implement sufficiently to break the root connection with the ground, the beets being left in the soil, an increase of sucrose takes place. There does not appear to be anything in the organism of the beet to induce such an expectation.

The evaporation experiments were made in two series:

(1) With beets fastened up in a bag and kept from the sun and wind.

(2) With beets under normal exposure to air and sun.

Table of first series.

Date.	Maximum air temperature.	(1) Weight of beet.	Loss.	(2) Weight of beet.	Loss.	(3) Weight of beet.	Loss.	(4) Weight of beet.	Loss.
	°	*Grams.*	*Per cent.*	*Grams.*	*Per cent.*	*Grams.*	*Per cent.*	*Grams.*	*Per cent.*
Oct. 12	53	1,283	....	648	....	753	....	426	....
Oct. 13	63	1,242	3.2	620	4.4	725	3.8	404	5.2
Oct. 14	52	1,188	7.3	592	8.8	703	6.7	381	10.6
Oct. 15	52	1,166	9.2	579	10.7	691	8.3	370	13.2
Oct. 16	76	1,136	11.5	563	13.2	676	10.3	358	16
Oct. 17	65	1,111	13.4	550	15.2	660	12.4	350	17.9
Oct. 18	59	1,085	15.5	538	17	650	13.7	329	22.8
Oct. 19	67.5	1,055	17.8	518	20.1	631	16.2	315	26.1

Table of second series.

Date.	Maximum air temperature.	(1) Weight of beet.	Loss.	(2) Weight of beet.	Loss.	(3) Weight of beet.	Loss.	(4) Weight of beet.	Loss.
	°	*Grams.*	*Per cent.*	*Grams.*	*Per cent.*	*Grams.*	*Per cent.*	*Grams.*	*Per cent.*
Oct. 12	53	724	....	661	....	503	....	580	....
Oct. 13	63	661	8.8	592	10.5	457	9.2	537	7.5
Oct. 14	52	620	14.4	542	18	418	16.9	501	13.7
Oct. 15	52	592	18.3	516	22	401	20.3	473	18.5
Oct. 16	76	570	21.3	493	25.5	375	25.5	456	21.4
Oct. 17	65	548	24.4	468	29.2	366	27.3	435	25
Oct. 18	59	526	27.4	447	32.4	351	30.3	416	28.3
Oct. 19	67.5	505	30.3	426	35.6	335	23.4	396	31.8

If the mean loss of weight be taken of the individual beets each day, as shown by the two tables, a ratio of evaporation may be determined, and a standard of correction established approximately exact, to be applied in the analysis of beets which have been some time out of the ground.

First series, ratio of evaporation.		Second series, ratio of evaporation.	
	Per cent.		*Per cent.*
Loss of weight for one day	4.2	Loss of weight for one day	9
two days	8.5	two days	15.7
three days	10.4	three days	19.8
four days	12.8	four days	23.4
five days	14.7	five days	26.5
six days	17.3	six days	29.6
seven days	20	seven days	32.5

In addition to the observations conducted with individual beets, an experiment was made with a square rod of beets in the middle of a large plat. The beets were got up and the tops removed exactly as though prepared for the factory and then left lying on the ground with a normal exposure to the air and sun.

Third series.

Weight of 1 square rod of beets.		Ratio of evaporation.	
	Pounds.	Loss of weight for—	*Per cent.*
Original weight	267.5	Two days	15.6
Second weight	226	Four days	21.9
Third weight	209	Six days	28.3
Fourth weight	192		

Upon the third day of exposure rain fell, consequently the evaporation was somewhat retarded.

It will be understood that the "loss of weight" for the given periods means the loss in per cent of the weight of the beet and not the per cent of water evaporated of the original water contained in the beet. The per cent of water lost would be greater than the numbers given.

As the "loss of weight" implies the loss of weight of the beet, the per cent of loss means an equal per cent gain in the reading of the sucrose, and the correction should be as follows:

A beet which reads 15 per cent of sucrose, but which has lost 20 per cent of its original weight, should be read: Sucrose in juice, 15 per cent less; loss of weight in beet, 20 per cent; actual sucrose in juice, 12 per cent.

In proceeding to a consideration of the second proposition, viz, "the action upon the sucrose present in the beet consequent upon breaking the connection of the latter with the soil," the data obtained in the evaporation experiments are of the first value. It may, in the first place, be indicated that any apparent increase of sucrose in a beet which has had its taproot broken, or which has been in any way detached or

loosened in its connection with the soil, is due wholly to a loss of weight in the beet by evaporation, and a proportional relative increase in the per cent of solids in the same. If a beet is disturbed sufficiently to break the taproot and the hundreds of small fibrous rootlets, even if it is not lifted out of the soil, the leaves rapidly wilt and in time the flesh of the beet becomes soft. The simple explanation is that the evaporation of water from the surface of the beet, which proceeds without intermission during the whole period of growth, continues after the breaking of the connection of the beet with the soil, but the connection with the soil being broken, the beet is no longer able to take up fresh water from the earth to replace the amount lost by evaporation. Consequently the beet loses weight, and an apparent increase of sucrose takes place, the latter being solely due to the decrease of water in the organism and a corresponding increase of solid matters.

There is another phase to the question under consideration. Does a loss of sucrose, through decomposition, take place in the beet after it is taken out of the soil and stored either under the surface of the ground in pits or silos or in any other way? Actual experiment could be the only means of deriving an answer to the proposition.

At the time that the beets of each of the varieties were gotten up for analysis and for the selection of mother beets for propagation use, a certain portion of the latter class were placed in small pits in the ground about 9 inches under the surface and well protected with moist earth. A part of the beets was placed in the pits with the tops on, and the other part the tops were cut off 1 inch from the neck before they were stored. The beets were kept in the ground in those pits from October 15–19 to November 6, when they were taken out and put in the permanent silos for the winter. At the same time a further number of beets was left in the ground till a later date and then gotten up and analyzed fresh in order to compare with the beets placed in the pits. The results were as follows:

Field B.

Variety.	Fresh beets.				Stored beets.			
	Date.	Sucrose in juice.	Date.	Sucrose in juice.	Date.	Sucrose in juice.	Date.	Sucrose in juice.
		Per cent.		*Per cent.*		*Per cent.*		*Per cent.*
Desprez	Oct. 6	13.5	Oct. 21	14.1	Oct. 6	13.5	Nov. 6	12.3
Vilmorin	Oct. 8	13.8	Oct. 22	13.4	Oct. 8	13.8	Nov. 6	12.2
Kleinwanzlebener	Oct. 10	14.7	Oct. 23	14.1	Oct. 10	14.7	Nov. 6	13.4

Field A.

Variety.	Fresh beets.		Stored beets.	
	Date.	Sucrose in juice.	Date.	Sucrose in juice.
		Per cent.		*Per cent.*
Elite	Oct. 13	14.5	Nov. 6	12.7
Knauer	Oct. 14	14.8	Nov. 6	11.6
Lemoire	Oct. 15	14.1	Nov. 6	13
Desprez	Oct. 17	14.4	Nov. 7	12.5
Vilmorin	Oct. 18	14.6	Nov. 7	12.9
Kleinwanzlebener	Oct. 19	14.5	Nov. 7	12.5

In comparing the results of the "fresh" and "stored" beets it must be remembered that the latter had lost some water by evaporation, so that the sucrose should have been higher in the juices of the stored beets than in the juices of the fresh beets. It is thus seen that the actual decrease and loss of sugar in the stored beets was greater than is indicated in the table given.

An experiment was made with individual beets, also with the purpose of observing if there were a decrease in sucrose contained in the beets after removal of the latter from the soil. The experiment was made as follows:

Twenty beets were taken fresh from the soil, the tops removed, washed, and dried. Each beet was cut into equal halves and the halves marked No. 1 and No. 2. No. 1

of each of the twenty beets was immediately weighed, the juice expressed and the sucrose determined in the latter. The No. 2 halves of the beets were also weighed immediately and afterwards laid upon a board with the cut surfaces upward and remained thus for five days, when they were reweighed, in order to ascertain the loss of weight by evaporation. After reweighing, the No. 2 halves were immediately analyzed and the actual sucrose contained in the juice of each half determined.

Having determined the sucrose contained in the No. 1 half of each of the beets, and having further determined the loss of weight in each of the No. 2 halves, it was possible to observe whether a decrease of sucrose had taken place or not. The per cent increase of sucrose in the juices of the No. 2 halves should be exactly equal to the per cent decrease in the weight of the beets, if no loss of sucrose had taken place.

Instead of the data belonging to each beet being given, the mean data will be given of the No. 1 and No. 2 series.

Beets.	Mean of first weights.	Mean of second weights.	Mean of sucrose in juices.	Loss of weight of beets.	Increase of sucrose in juice.	Loss of sucrose.
	Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
No. 1 halves	350		14.5			
No. 2 halves	345	248	18.4	28.2	19.2	9

If the juices of the No. 2 halves had gone up in sucrose in the exact proportion per cent that the beets had decreased in weight, those juices would have contained 20.2 per cent instead of 18.4 per cent which was actually found. The difference between 20.2 per cent and 18.4 per cent gives the loss of 9 per cent of the original content of sucrose in the beets.

The data obtained from the experiments with large numbers of beets of six varieties, and the observations made with the halves of the individual beets, indicate that a loss of sucrose takes place when the beets are removed from their normal connection with the soil.

In reviewing generally the characteristics of the season, and the result of the experimental work of the station, we have to observe the following:

The late date upon which it was decided to establish the station at its present location did not permit of the best advised plan of cultivation, and delayed the conducting of farm operations till April, which should have been performed in the preceding fall.

The cultural season was marked by the widest extremes of climatic conditions. The planting period was a continuance of drought, lasting from April 20 to June 2. At the end of the dry period a succession of weeks of rains followed, which were abnormal when compared with the usual precipitation for the months of June and July. The abnormal conditions accompanied the development of the season to its end. The steady and continuous heat common to the months of July and August was, in the most part, postponed till the middle of September; and the extreme heat of the latter month was followed again by rains which amounted to more than twice the normal precipitation for that period. The results of the work of this season have been achieved under the influence of climatic conditions unusually unfavorable.

Experiments conducted comparatively with the soils of Maryland, Indiana, and Nebraska indicated the peculiar adaptability of the soil to the climate in the latter State, which fact may be found to obtain equally for the other States.

The general results of the analytical season are found to be satisfactory both in respect of the weight of beets and yield of sugar per acre. In such respect the results of the Schuyler Station compare satisfactorily with the work of corresponding stations in Europe.

The observations made upon the results of the six varieties used in the experimental work of the station, have resolved those varieties into two classes, in respect

of the actual money value per acre of their products, viz, the first class including the "Kleinwanzlebener," "Desprez," and "Vilmorin" varieties, whose values are uniform. The "Lemaire," "Elite," and Knauer" have also an approximately equal value, which, however, is much below that of the three former varieties.

The experiments conducted with the view of observing the results of early and late planting indicated that early planting may be expected to give the highest money value yield per acre. That conclusion, indicated by the experiments upon the small plats, is supported by the actual results obtained in Field B in comparison with Field A, the beets in the former field having been planted several days earlier than the other, and the rate of development continued fourteen days in advance of the beets in the latter field.

The fertilizer experiments indicate that the soil of the station farm contains all the constituents of plant food in abundance, and that artificial aid can not be given to the growing plant with any apparent advantage.

In respect of the distances that the beets should be placed from each other, or the number of plants given to an acre, the experiments on the No. 1 series of the small plats have shown conclusively that the money value of the crop was greatest where the greatest number of beets were placed upon the acre. The economic consideration, viz, the greater cost of raising an acre of beets planted closely together is very secondary in comparison with the greater money value of the product. Instead of the distances at which beets should be planted between the rows being regulated by the consideration of implements which have been invented for the cheap cultivation of the crop, the character of the implements should be adapted to the highest value and advantage of the crop.

The means of analyses indicating the condition of the beets at the periods when the tests were made show that the crop generally, and particularly in Field B, where the beets were planted early, had reached a high condition, in respect of the weight of the beets and the sugar content of the juices, on September 15. Further, that certain of the varieties had reached a maximum value by September 25, and that all of the varieties were at their best by October 15, and after that date the content of sucrose began to fall away. Those observations indicate the time when, in a normal season, the harvesting and handling of the beets by the factories should commence in that part of Nebraska. The past season has been an abnormal and late one, and it is apparent that with a moderately early planting season (April 20 to May 1), and proper cultivation, a crop should be ready for the factory commencing September 1. The period of maturity depends upon the beet as well as the time of planting and cultivation, and in such respect it is indicated that if the three varieties are used, which have been found to be the best this year, it would be advisable to plant them in the following order: "Vilmorin," "Kleinwanzlebener," "Desprez," and they will mature most advantageously in that order for the factory. In view of the early date in the season that the factories may have to suspend operations on account of frost, an "early season" is of the greatest importance. Commencing September 1, a three months' factory season is almost assured, and that would enable a factory with a capacity of 300 tons per day to work up about 30,000 tons of beets by December 1, or the product of 3,000 acres at 10 tons per acre.

The experiments made in order to determine the loss of weight by evaporation, and to ascertain the effect of evaporation with the removal of the beets from the earth upon the sucrose contained in the beet have indicated that no gain occurs in the sucrose content of the beet, but that an actual loss of sugar takesplace if any length of time is allowed to transpire between the raising of the beets from the soil and the handling of them in the factory. It thus appears of advantage to the grower and the manufacturer that the beets should not only be harvested at the period of their maximum sugar value, but that they should be handled by the factory as nearly as possible as they come fresh from the field.

TABLE I.—*Analyses of one hundred Kleinwanzlebener Elite sugar beets.*

[Date: September 21.]

No.	Average weight beets.	Sucrose in juice.	No.	Average weight beets.	Sucrose in juice.	No.	Average weight beets.	Sucrose in juice.	No.	Average weight beets.	Sucrose in juice.
	Grams.	*Per ct.*		*Grams.*	*Per ct.*		*Grams.*	*Per ct.*		*Grams.*	*Per ct.*
1	231	16.8	26	650	15.9	51	602	15.8	76	401	16.8
2	380	12.2	27	223	16.0	52	484	15.1	77	272	15.8
3	766	11.8	28	288	15.0	53	412	14.8	78	343	15.5
4	738	14.0	29	482	13.7	54	537	14.0	79	342	18.9
5	736	13.2	30	96	16.4	55	814	10.0	80	709	12.7
6	742	12.6	31	409	16.4	56	418	15.6	81	346	14.0
7	341	13.5	32	565	14.3	57	343	18.4	82	350	16.6
8	411	13.5	33	625	18.0	58	377	17.6	83	858	14.2
9	255	14.6	34	770	13.7	59	679	13.9	84	625	15.7
10	564	12.7	35	367	15.8	60	519	15.5	85	250	17.0
11	292	15.2	36	725	13.9	61	931	13.5	86	228	17.8
12	149	13.0	37	189	13.5	62	470	16.7	87	328	15.8
13	145	15.0	38	502	13.8	63	370	16.7	88	432	15.4
14	412	13.6	39	538	14.5	64	439	16.5	89	265	17.6
15	254	14.6	40	636	16.4	65	243	17.6	90	359	16.0
16	224	16.0	41	325	18.1	66	239	17.0	91	296	14.0
17	395	13.4	42	489	16.9	67	278	16.2	92	220	15.2
18	140	17.0	43	473	16.7	68	195	15.5	93	240	15.2
19	212	13.0	44	281	14.5	69	279	18.2	94	510	17.2
20	1,124	12.2	45	241	17.3	70	306	15.9	95	497	15.3
21	171	16.8	46	294	17.7	71	431	14.4	96	522	13.8
22	229	16.0	47	354	16.8	72	565	15.0	97	360	17.8
23	598	14.0	48	379	14.1	73	349	15.7	98	165	18.7
24	227	17.2	49	167	15.8	74	360	17.2	99	120	18.6
25	219	17.8	50	390	13.6	75	177	16.7	100	119	20.4

TABLE II.—*Variety Kleinwanzlebener Elite, analyzed in eighty groups of ten beets each.*

[Date: September 22.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	472	17.4	13.5	78.1	42	192	19.3	17.0	88.1
2	398	18.4	14.9	81.0	43	299	18.3	15.4	84.2
3	579	17.8	14.1	79.2	44	357	20.2	16.9	83.7
4	422	18.4	15.1	82.1	45	261	17.8	14.4	80.9
5	378	18.8	15.3	81.4	46	346	18.7	15.9	85.0
6	454	18.4	14.5	78.8	47	331	18.8	15.8	84.0
7	410	18.9	15.1	80.0	48	331	19.8	16.9	85.4
8	396	18.4	14.9	81.0	49	348	18.7	15.4	82.4
9	404	18.4	14.4	78.3	50	303	18.7	15.4	82.4
10	363	17.9	16.3	91.0	51	303	18.7	15.5	82.9
11	394	19.2	15.5	80.7	52	341	19.3	16.9	87.6
12	430	19.0	15.6	82.1	53	363	18.4	15.5	84.2
13	387	19.0	15.3	80.5	54	346	18.4	15.1	82.0
14	344	19.3	16.1	83.4	55	274	18.7	15.8	84.5
15	406	18.6	15.3	82.3	56	335	18.6	15.7	84.4
16	359	19.1	15.6	81.7	57	342	18.4	15.6	84.8
17	337	19.6	16.6	84.7	58	341	19.2	16.8	87.5
18	291	19.7	16.7	84.8	59	317	18.2	15.2	83.5
19	307	18.9	14.6	78.5	60	279	19.3	16.3	84.5
20	483	17.9	14.4	80.4	61	299	19.2	16.2	84.4
21	421	18.7	15.8	84.4	62	241	19.1	16.1	84.3
22	354	18.3	15.3	83.6	63	327	18.7	15.3	81.8
23	421	19.5	16.1	82.6	64	286	18.5	15.1	81.6
24	331	19.1	15.3	80.0	65	271	17.8	15.3	87.1
25	467	18.4	16.0	87.0	66	217	19.3	16.6	86.0
26	298	19.3	16.1	83.4	67	238	18.5	16.7	90.3
27	330	19.6	16.5	84.2	68	262	19.6	17.5	89.2
28	292	18.3	15.1	82.5	69	332	18.6	15.8	84.9
29	252	18.7	15.7	84.0	70	296	18.8	15.5	82.4
30	328	18.6	15.6	83.9	71	364	18.7	15.4	82.4
31	319	18.8	15.8	84.0	72	341	18.6	15.0	80.6
32	363	19.0	16.0	84.2	73	281	19.2	16.1	83.9
33	318	18.6	15.4	82.8	74	311	18.2	15.0	82.4
34	271	18.7	15.9	85.0	75	285	19.5	16.8	86.2
35	307	19.1	16.7	87.4	76	358	19.3	16.1	83.4
36	337	18.2	15.1	83.0	77	394	17.9	14.6	81.6
37	246	19.0	16.0	84.2	78	382	19.3	16.3	84.5
38	231	19.6	17.4	88.8	79	329	18.1	15.0	82.9
39	325	18.5	15.6	84.3	80	234	18.9	16.3	86.2
40	311	19.8	16.7	84.3					
41	238	19.0	16.9	89.0	Mean	....	....	15.7	84.6

TABLE III.—*Showing analysis of sixty-two sets, of ten beets each, of the Ferdinand Knauer variety.*

[Date: September 24.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	471	18.7	15.5	82.9	33	262	19.0	16.0	84.2
2	372	18.6	15.1	81.2	34	272	18.9	16.4	86.8
3	360	18.0	15.0	83.3	35	379	18.6	15.8	84.9
4	451	18.8	15.2	80.8	36	264	18.2	14.8	81.3
5	469	17.2	14.1	82.0	37	256	19.1	16.1	84.3
6	372	18.0	15.0	83.3	38	323	18.7	15.8	84.5
7	503	16.5	13.0	78.8	39	308	18.5	15.3	82.7
8	353	18.4	15.6	84.8	40	325	18.0	15.5	86.4
9	326	18.2	15.3	84.1	41	268	18.3	14.9	81.0
10	505	17.2	13.9	80.8	42	266	18.8	15.7	83.5
11	371	18.1	15.6	86.2	43	405	15.8	14.4	91.1
12	503	17.9	14.9	83.2	44	393	17.9	14.5	81.0
13	400	17.3	14.5	83.8	45	314	18.0	15.4	85.6
14	412	17.8	15.0	84.3	46	255	18.1	15.5	85.7
15	393	18.5	15.8	85.4	47	360	18.7	15.8	84.5
16	419	17.9	15.0	83.8	48	347	18.2	15.8	81.8
17	499	17.8	15.0	84.3	49	314	17.6	15.8	89.8
18	328	17.4	16.0	92.0	50	333	18.0	15.3	85.0
19	284	17.8	15.0	84.3	51	332	17.4	14.5	83.3
20	392	18.9	15.8	83.6	52	489	16.4	12.3	75.0
21	313	18.7	15.4	82.4	53	319	17.5	15.0	85.7
22	164	18.4	15.8	85.9	54	282	16.9	14.3	84.6
23	287	18.1	14.8	81.8	55	333	18.5	14.7	79.5
24	206	19.7	16.2	82.2	56	317	17.3	13.8	79.8
25	275	18.1	14.9	82.3	57	374	17.8	14.3	80.3
26	250	17.4	14.3	82.2	58	364	17.7	14.0	79.1
27	251	18.2	14.4	79.1	59	362	18.4	15.6	84.8
28	281	18.6	15.5	83.3	60	359	18.6	15.2	81.7
29	256	18.6	15.5	83.3	61	374	17.4	14.0	80.5
30	272	17.5	14.4	82.3	62	551	17.5	13.8	78.9
31	186	19.2	17.3	90.1					
32	279	18.5	15.5	83.8	Mean.	....	....	15.1	84.9

TABLE IV.—*Showing analyses of beets in sixty sets, of ten beets each, of the Lemaire variety.*

[Date: September 26.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	538	17.2	13.3	77.3	32	634	17.1	13.3	77.8
2	415	17.1	13.7	80.1	33	320	17.5	14.2	81.1
3	343	17.2	14.1	82.0	34	325	17.5	14.0	80.0
4	657	17.1	13.3	77.8	35	507	17.1	13.9	81.3
5	492	16.4	13.0	79.3	36	535	16.9	14.2	84.0
6	422	17.7	14.5	81.9	37	290	17.4	14.4	82.7
7	542	16.8	13.5	80.4	38	488	17.5	14.2	81.1
8	461	16.9	14.3	84.6	39	514	16.9	14.0	82.8
9	465	16.5	13.4	81.2	40	286	17.7	14.9	84.2
10	504	17.7	14.1	79.7	41	371	17.5	14.0	80.0
11	351	18.4	14.7	80.0	42	374	17.4	14.4	82.7
12	417	17.9	14.5	81.0	43	370	17.8	14.5	81.5
13	485	17.0	13.7	80.6	44	331	18.4	15.3	83.2
14	438	17.4	13.9	79.9	45	287	17.9	15.1	84.4
15	486	16.4	13.4	81.7	46	278	15.5	12.0	77.4
16	527	17.5	14.1	80.6	47	377	17.4	14.0	80.5
17	338	16.1	14.2	88.2	48	388	16.5	13.5	81.8
18	499	17.5	14.3	81.7	49	375	17.7	14.0	79.1
19	493	16.7	13.4	80.2	50	387	17.3	14.6	84.4
20	422	17.6	15.1	85.8	51	338	17.8	14.3	80.3
21	314	16.3	13.3	81.6	52	359	17.6	14.7	83.5
22	327	17.3	14.3	82.6	53	371	17.4	13.9	79.9
23	383	17.8	14.7	82.6	54	365	15.9	14.7	92.5
24	540	16.7	13.0	77.8	55	484	17.1	14.4	84.2
25	517	17.8	14.0	78.7	56	398	17.0	13.4	78.8
26	517	17.6	14.2	80.7	57	384	16.9	13.1	77.3
27	354	16.7	13.7	82.0	58	365	15.9	13.3	83.6
28	313	17.3	13.7	79.2	59	372	16.9	13.3	78.7
29	452	17.2	14.1	82.0	60	244	16.6	13.9	83.7
30	559	17.0	13.8	81.2					
31	361	16.7	13.1	78.4	Mean	....	....	13.8	81.2

Table V.—*Showing analyses of twenty sets of ten beets each of the Kleinwanzlebener Elite variety.*

[Date: October 13.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
		Grams.	*Per cent.*			*Grams.*		*Per cent.*	
1	289	16.9	14.7	87.0	12	349	16.8	14.3	85.1
2	278	17.1	14.6	85.4	13	334	16.1	13.8	85.7
3	287	16.6	13.2	79.5	14	314	16.5	14.0	84.8
4	295	17.0	12.6	74.1	15	259	15.7	14.3	91.1
5	344	17.0	13.9	81.8	16	310	16.2	13.4	82.7
6	355	16.4	14.5	88.4	17	203	16.3	13.0	79.8
7	278	16.2	13.9	85.8	18	143	17.2	14.9	86.6
8	299	17.0	14.0	82.4	19	267	16.9	14.5	85.8
9	309	16.6	13.7	82.5	20	162	16.8	15.3	91.1
10	372	16.3	14.6	89.6					
11	364	16.5	13.8	83.6	Mean.	....	....	14.1	84.6

Table VI.—*Showing analyses of twenty sets of ten beets each of the Ferdinand Knauer variety.*

[Date: October 14.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	323	16.4	12.4	75.6	12	231	17.0	15.4	90.6
2	382	16.3	12.8	78.5	13	217	17.5	15.1	86.3
3	323	16.6	14.0	84.3	14	221	16.8	15.5	92.3
4	366	16.3	14.3	87.7	15	229	15.8	14.5	91.8
5	355	16.7	15.1	90.4	16	245	16.8	14.2	84.5
6	330	17.2	14.7	85.5	17	188	16.5	14.8	89.7
7	267	17.6	15.7	89.2	18	225	15.7	13.9	88.6
8	233	17.7	16.1	91.0	19	278	17.3	15.6	90.2
9	361	16.4	14.5	88.4	20	228	17.0	15.0	88.2
10	251	16.8	16.6	98.8					
11	254	17.0	15.3	90.0	Mean.	....	....	14.8	88.1

Table VII.—*Showing analyses of twenty sets of ten beets each of the Lemaire variety.*

[Date: October 15.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	378	17.2	15.2	88.4	12	354	16.4	13.1	79.9
2	356	16.9	13.9	82.2	13	358	15.8	12.9	81.6
3	358	17.0	14.0	82.3	14	364	16.4	13.5	82.3
4	374	17.2	14.4	83.7	15	333	16.8	13.4	79.8
5	351	17.2	14.4	83.7	16	447	16.3	13.2	81.0
6	392	17.1	15.0	87.7	17	286	16.3	14.2	87.1
7	471	16.6	13.9	83.7	18	294	16.6	13.9	83.7
8	321	16.6	13.7	82.5	19	312	16.4	14.3	87.2
9	323	16.2	13.4	82.7	20	161	16.8	14.0	83.2
10	367	16.6	13.9	83.7					
11	369	15.5	12.9	83.2	Mean.	....	....	13.9	83.5

TABLE VIII.—*Showing analyses of twenty sets of ten beets each of the Desprez variety.*

[Date: October 16.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	341	16.3	13.7	84.0	12	298	16.4	13.6	82.9
2	354	16.1	12.9	80.1	13	374	15.6	13.5	86.6
3	366	17.6	14.7	83.5	14	337	16.1	14.4	89.4
4	575	16.6	13.7	82.5	15	333	15.7	13.9	88.5
5	446	16.3	13.2	81.0	16	339	15.5	13.4	86.5
6	515	16.5	14.9	90.3	17	318	16.5	14.0	84.8
7	363	16.8	13.3	79.2	18	309	16.5	13.8	83.6
8	373	17.1	13.4	78.4	19	253	16.5	14.8	89.7
9	461	15.8	13.1	82.9	20	174	17.9	16.1	89.9
10	343	16.2	13.0	80.2					
11	292	16.8	14.8	88.1	Mean.	....	....	13.9	84.6

TABLE IX.—*Showing analyses of twenty sets of ten beets each of the Desprez variety.*

[Date: October 17.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in beets.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	521	15.8	13.0	82.3	12	321	17.1	14.0	81.9
2	457	15.7	13.1	83.4	13	348	17.2	15.2	88.4
3	339	16.7	14.3	85.6	14	565	17.2	14.0	81.4
4	324	16.4	13.7	83.5	15	299	16.7	14.2	85.0
5	425	16.7	14.4	86.2	16	317	17.1	14.7	86.0
6	370	16.6	13.7	82.5	17	309	17.2	15.4	89.5
7	314	16.2	13.5	83.3	18	330	17.7	15.7	88.7
8	312	17.0	13.8	81.2	19	283	16.9	14.9	88.2
9	279	16.1	14.3	88.8	20	205	17.2	14.6	84.9
10	507	17.1	14.4	84.2					
11	366	17.3	14.3	82.6	Mean	....	....	14.3	84.9

TABLE X.—*Showing analyses of twenty sets of ten beets each of the Kleinwanzlebener Elite variety.*

[Date: October 19.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	392	17.5	15.5	88.6	12	364	16.9	13.2	78.1
2	396	17.4	14.3	82.2	13	468	17.1	14.8	86.5
3	392	16.9	13.5	79.9	14	381	18.4	15.4	83.7
4	506	16.9	13.0	76.9	15	330	16.7	14.2	85.0
5	396	17.7	14.7	83.0	16	357	18.0	15.0	83.3
6	523	16.2	12.8	79.0	17	377	16.5	13.9	84.2
7	362	18.1	15.1	83.4	18	384	17.7	14.5	81.9
8	335	17.8	15.0	84.3	19	334	18.0	15.0	83.3
9	378	17.9	14.9	83.2	20	403	18.2	16.0	87.9
10	396	16.6	13.2	79.5					
11	379	16.7	13.9	83.2	Mean	....	....	14.4	82.8

TABLE XI.—*Showing analyses of eighty beets in sets of tens of the Lemaire variety.*

[Date: October 20.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	347	16.3	14.9	91.4	6	277	16.0	14.0	87.5
2	320	16.7	14.1	84.4	7	256	16.6	15.5	93.4
3	304	16.3	14.4	88.3	8	165	16.7	14.1	84.4
4	264	17.0	15.0	88.2					
5	270	16.5	15.0	90.9	Mean.	....	....	14.6	88.5

TABLE XII.—*Showing analyses of one hundred beets of the Desprez variety.*

[Date: October 20.]

No.	Average weight beets.	Sucrose in juice.	No.	Average weight beets.	Sucrose in juice.	No.	Average weight beets.	Sucrose in juice.	No.	Average weight beets.	Sucrose in juice.
	Grams.	*Per ct.*		*Grams.*	*Per ct.*		*Grams.*	*Per ct.*		*Grams.*	*Per ct.*
1	566	15.5	9	242	15.2	17	314	15.8	25	382	15.5
2	292	14.7	10	412	15.5	18	346	12.9	26	132	17.0
3	292	15.2	11	519	14.9	19	365	16.6	27	240	15.5
4	394	16.0	12	299	16.4	20	418	15.0	28	213	13.9
5	483	16.2	13	499	14.9	21	718	14.2	29	187	14.3
6	170	10.9	14	287	13.4	22	368	16.1	30	343	13.2
7	275	14.5	15	279	15.5	23	292	16.0			
8	347	12.6	16	162	15.2	24	475	14.2			

[Date: October 21.]

31	200	14.6	49	597	14.0	67	447	13.0	85	607	15.7
32	328	14.2	50	499	14.6	68	805	15.3	86	411	14.9
33	426	14.2	51	350	13.1	69	691	9.9	87	272	14.1
34	377	11.8	52	327	14.7	70	489	12.9	88	434	13.3
35	281	9.6	53	270	13.0	71	625	12.9	89	437	14.9
36	730	12.9	54	284	17.4	72	622	12.8	90	289	14.1
37	324	15.0	55	309	16.6	73	215	12.7	91	396	11.0
38	639	14.5	56	304	14.8	74	183	18.2	92	217	16.1
39	444	13.2	57	376	12.3	75	457	15.0	93	150	13.0
40	400	13.8	58	225	14.4	76	191	15.8	94	627	11.2
41	298	14.0	59	442	15.1	77	320	14.9	95	126	14.6
42	630	13.0	60	200	13.9	78	270	14.3	96	186	7.5
43	496	15.1	61	287	12.2	79	226	12.2	97	359	11.8
44	270	15.0	62	153	14.2	80	265	12.9	98	271	13.6
45	359	14.8	63	211	14.5	81	337	12.8	99	280	13.9
46	495	11.5	64	307	14.0	82	899	12.2	100	529	16.0
47	270	12.3	65	1,023	12.7	83	318	13.0			
48	197	12.9	66	466	14.6	84	427	13.6	Mean	....	14.1

TABLE XII, *bis*.—*Showing analyses of thirty-eight sets of ten beets each of the Desprez variety.*

[Date: October 21.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams		*Per cent.*			*Grams.*		*Per cent.*	
1	369	15.7	12.9	86.0	21	323	16.4	14.8	90.2
2	386	16.6	15.0	90.4	22	342	16.4	14.0	85.4
3	376	16.5	15.7	95.1	23	351	16.4	14.0	85.4
4	386	15.4	13.2	85.7	24	321	15.5	13.3	85.8
5	386	15.9	13.8	86.8	25	372	16.1	14.2	88.2
6	368	16.3	13.7	84.0	26	343	15.8	13.3	84.2
7	380	15.4	13.0	84.4	27	338	16.2	15.2	93.8
8	398	15.6	13.7	87.8	28	353	15.3	13.0	85.0
9	378	15.6	13.9	89.1	29	339	15.6	13.9	89.1
10	323	15.7	14.9	94.9	30	370	14.4	12.5	86.8
11	359	15.8	13.5	85.4	31	351	15.8	13.6	86.0
12	386	15.9	14.7	92.5	32	355	15.9	14.6	91.8
13	271	16.4	14.4	87.8	33	319	14.9	13.3	89.3
14	318	16.0	14.5	90.6	34	373	15.9	14.4	90.6
15	351	15.8	13.7	86.7	35	335	16.1	14.0	87.0
16	476	15.5	13.7	88.4	36	352	16.4	14.6	82.9
17	411	16.0	13.8	86.2	37	470	15.3	12.4	81.0
18	380	15.9	13.7	86.1	38	366	15.6	14.5	93.0
19	312	15.6	13.0	83.3					
20	298	16.2	14.0	86.4	Mean	....	....	14.0	87.7

TABLE XIII.—*Showing analyses of sixty-six sets of ten beets each of the Vilmorin variety.*

[Date: October 22.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	372	15.4	12.4	80.5	35	536	16.0	13.3	83.1
2	382	15.5	13.3	85.8	36	464	16.3	13.9	85.3
3	368	16.7	13.8	82.6	37	340	16.3	13.0	79.8
4	381	15.6	13.1	84.0	38	343	15.4	13.2	85.7
5	390	16.1	13.2	82.0	39	384	15.3	12.9	84.3
6	363	16.0	15.0	93.7	40	365	16.0	14.2	88.8
7	384	15.9	13.6	85.5	41	396	15.5	13.2	85.2
8	389	14.7	12.6	85.7	42	377	16.1	13.4	83.2
9	356	16.1	15.0	93.2	43	384	15.1	13.3	88.1
10	368	16.4	14.2	86.5	44	386	16.1	14.0	87
11	331	15.7	13.0	82.8	45	385	15.5	12.2	78.7
12	758	16.3	14.1	86.5	46	317	16.6	13.9	83.7
13	351	16.6	15.5	93.4	47	359	14.7	13.4	91.2
14	355	16.4	13.7	83.5	48	359	15.2	12.0	78.9
15	366	15.5	13.2	85.2	49	296	15.7	13.2	84.1
16	377	15.5	13.6	87.7	50	233	16.0	14.0	87.5
17	366	15.4	12.4	80.5	51	353	16.4	14.0	85.4
18	352	16.2	14.2	87.7	52	292	16.0	14.7	91.0
19	341	16.0	14.6	91.3	53	335	15.8	13.7	86.7
20	362	15.8	13.8	87.3	54	357	14.5	13.2	91.0
21	342	15.2	13.6	89.5	55	353	16.0	13.9	86.9
22	315	15.3	13.4	87.6	56	328	15.7	13.2	84.1
23	363	15.9	12.8	80.5	57	309	16.2	14.1	87.0
24	357	16.2	14.0	86.4	58	290	16.5	13.9	84.2
25	361	16.8	13.8	82.1	59	372	16.9	14.8	87.6
26	321	16.5	14.0	84.8	60	392	15.9	13.2	83.0
27	371	16.1	14.8	91.9	61	198	17.1	15.2	88.9
28	376	15.7	13.4	85.4	62	284	15.5	14.3	92.3
29	321	15.3	13.0	85.0	63	243	15.4	12.2	79.2
30	291	15.7	13.0	82.8	64	238	16.3	13.6	83.4
31	410	15.9	13.5	84.9	65	243	16.4	15.0	91.5
32	350	16.5	14.8	89.7	66	185	17.0	14.5	85.3
33	495	15.6	13.0	83.3					
34	366	15.0	12.8	85.3	Mean	....	10.0	13.4	85.8

Table XIV.—*Showing analyses of sixty-two sets of ten beets each of the Kleinwanzlebener variety.*

[Date: October 23.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	361	15.4	14.4	93.5	26	452	11.6	13.0	78.3
2	396	15.4	12.3	79.9	27	459	16.9	14.1	83.4
3	397	16.8	14.6	86.9	28	443	15.9	13.4	84.3
4	383	16.8	14.8	88.1	29	379	17.4	14.9	85.6
5	397	16.3	14.7	90.2	30	397	17.0	14.5	85.3
6	386	17.4	15.0	86.2	31	387	16.8	14.7	87.5
7	390	16.0	12.9	80.6	32	589	17.0	14.3	84.1
8	394	16.4	14.9	90.9	33	390	17.1	14.4	84.2
9	379	16.7	14.3	85.6	34	361	16.3	13.2	81.0
10	394	16.7	14.2	85.0	35	369	16.6	13.3	80.1
11	387	17.2	13.9	80.8	36	373	16.8	13.8	82.1
12	371	16.5	13.9	84.2	37	394	16.9	14.7	87.0
13	374	16.4	14.8	90.2	38	384	16.7	13.7	82.0
14	664	17.0	13.6	80.0	39	396	16.9	14.2	84.0
15	439	16.6	13.7	82.5	40	386	17.4	14.5	83.3
16	441	15.3	12.2	79.7	41	383	17.2	14.9	86.6
17	459	14.6	12.0	82.2	42	378	17.1	14.4	84.2
18	360	16.5	13.9	84.2	43	377	16.0	14.2	88.8
19	562	16.1	13.0	80.7	44	549	16.8	13.9	82.7
20	475	16.3	13.2	81.0	45	352	17.4	14.9	85.6
21	451	17.2	14.5	84.3	46	371	17.0	14.5	85.3
22	503	16.0	13.3	83.1	47	374	17.9	15.2	84.9
23	463	16.3	13.4	82.2	48	366	16.5	13.7	83.0
24	527	17.3	14.9	86.1	49	383	17.6	14.3	81.2
25	459	16.5	13.6	82.4	50	374	17.6	14.8	84.1

[Date: October 24.]

51	356	17.0	13.9	81.8	58	326	16.4	13.4	81.7
52	340	16.6	14.0	84.3	59	318	16.9	14.3	84.6
53	324	18.0	14.5	80.6	60	358	16.2	13.0	80.2
54	379	16.7	13.8	82.6	61	360	16.4	13.9	84.8
55	355	17.3	14.0	80.9	62	409	17.1	14.4	84.2
56	349	16.7	13.9	83.2					
57	360	16.9	14.1	83.4	Mean	....	....	14.1	83.8

Table XV.—*Showing analyses of twenty sets of ten beets each of Kleinwanzlebener elite variety.*

[Date: October 31.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	454	16.5	13.4	81.2	12	357	16.2	13.9	85.8
2	289	16.9	13.9	82.2	13	333	16.6	14.3	86.1
3	325	17.2	14.5	84.3	14	297	17.4	14.4	82.7
4	344	17.4	14.8	85.1	15	302	16.9	14.1	83.5
5	351	16.9	14.0	82.8	16	304	17.1	14.4	84.2
6	357	16.8	13.2	78.6	17	296	17.0	14.3	84.1
7	341	17.9	14.8	82.7	18	274	17.4	14.4	82.7
8	347	15.9	13.7	86.1	19	221	17.3	15.0	86.7
9	256	16.2	14.4	88.9	20	239	17.1	13.7	80.1
10	369	16.2	14.3	88.3					
11	371	17.1	14.0	81.9	Mean	....	....	14.2	83.9

TABLE XVI.—*Showing analyses of twenty sets of ten beets each of the Ferdinand Knauer variety.*

[Date: November 2.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	386	15.6	12.0	76.9	12	387	15.7	13.1	83.4
2	386	16.3	13.2	81.0	13	394	16.3	13.4	82.2
3	375	16.1	13.3	82.6	14	342	16.4	13.5	82.3
4	363	14.6	11.7	80.1	15	290	16.4	13.7	83.5
5	370	14.8	11.6	78.4	16	246	17.5	14.8	84.6
6	394	15.1	11.7	77.4	17	290	17.3	14.4	83.3
7	416	16.4	13.5	82.3	18	224	16.2	13.8	85.2
8	355	15.8	12.9	81.6	19	170	16.6	14.4	86.7
9	315	16.5	13.2	80.0	20	140	15.7	13.9	88.5
10	317	17.1	14.2	83.0					
11	360	15.9	12.5	78.6	Mean	....	....	13.2	82.1

[Date: November 2.]

TABLE XVII.—*Showing analyses of twenty sets of ten beets each of the Lemaire variety.*

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	370	15.5	12.9	83.2	12	390	15.8	12.5	79.1
2	387	16.0	12.8	80.0	13	380	15.8	12.7	80.4
3	318	16.0	13.8	86.2	14	565	15.5	11.9	76.8
4	389	15.7	12.6	80.3	15	380	15.2	12.2	80.3
5	379	16.9	13.3	78.7	16	370	16.3	13.5	82.8
6	529	15.5	12.4	80.0	17	349	15.8	12.0	75.9
7	376	15.0	12.0	80.0	18	361	14.3	11.3	79.1
8	535	15.3	11.2	73.2	19	391	16.3	13.7	84.0
9	330	15.7	13.2	84.1	20	663	15.3	12.2	79.7
10	342	15.8	12.6	79.7					
11	358	15.9	12.7	79.8	Mean	....	....	12.6	80.0

TABLE XVIII.—*Showing analyses of twenty sets of ten beets each of the Desprez variety.*

[Date: November 2.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	382	15.5	12.7	81.9	12	502	15.3	12.0	78.4
2	350	15.9	13.3	83.6	13	339	15.4	13.1	85.1
3	392	15.7	12.0	76.4	14	371	15.6	12.7	81.4
4	391	15.9	13.0	81.8	15	391	16.2	12.6	77.8
5	556	14.8	11.5	77.7	16	559	15.1	12.2	80.8
6	389	16.4	13.8	84.1	17	383	15.0	11.5	76.6
7	382	15.3	12.4	81.0	18	379	15.8	12.8	81.0
8	373	15.4	12.6	81.8	19	395	14.9	11.9	79.9
9	481	16.0	12.8	80.0	20	389	15.5	13.0	83.9
10	466	16.2	13.4	82.7					
11	341	15.6	13.0	83.3	Mean	....	....	12.6	80.9

TABLE XIX.—*Showing analyses of twenty sets of ten beets each of the Vilmorin variety.*

[Date: November 2.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	465	15.1	11.8	78.1	12	210	15.5	13.2	85.2
2	329	15.7	13.7	87.3	13	248	16.1	13.7	85.1
3	361	15.3	12.8	83.7	14	317	15.8	13.5	85.4
4	326	15.2	12.5	82.2	15	365	15.3	13.0	85.0
5	446	15.2	12.4	81.6	16	360	15.3	12.4	81.0
6	382	15.3	12.5	81.7	17	351	15.8	13.3	84.2
7	382	15.8	13.2	83.5	18	334	15.7	13.6	86.6
8	298	16.0	13.0	81.2	19	261	15.9	13.5	84.9
9	347	15.7	12.6	80.3	20	267	17.0	14.3	84.1
10	286	15.1	13.3	88.1					
11	236	16.3	13.7	84.0	Mean	....	....	13.1	83.6

TABLE XX.—*Showing analyses of twenty sets of ten beets each of the Kleinwanzlebener variety.*

[Date, November 2.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	354	16.8	12.9	76.8	12	369	17.1	14.1	82.4
2	366	16.3	12.5	76.7	13	546	16.7	13.3	79.6
3	509	15.8	11.8	74.7	14	522	16.1	13.0	80.7
4	510	16.1	11.9	73.9	15	393	16.5	13.2	80.0
5	358	16.8	13.9	82.7	16	575	16.7	12.9	77.2
6	367	16.2	12.4	76.5	17	374	16.8	13.4	79.8
7	360	15.5	11.9	76.8	18	367	16.6	13.9	83.7
8	379	15.8	12.3	77.8	19	302	16.8	13.8	82.1
9	365	16.6	13.4	80.7	20	385	16.5	13.8	83.6
10	555	15.6	12.2	78.2					
11	559	15.8	12.9	81.6	Mean	....	....	13	79.7

TABLE XXI.—*Showing analyses of six sets of ten beets each of Plat No. 1.*

[Date: October 26.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	281	16.8	13.6	80.9	5	283	16.7	13.6	81.4
2	227	16.3	13.5	81.8	6	288	16.0	12.7	79.4
3	269	17.3	14.1	81.4					
4	331	16.6	13.2	79.5	Mean	....	....	13.5	80.8

TABLE XXII.—*Showing analyses of six sets of ten beets each of Plat No. 2.*

[Date: October 26.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1	222	16.2	13.4	82.7	5	256	15.7	13.4	85.4
2	226	16.7	13.7	82.0	6	224	15.4	13.0	84.4
3	248	16.2	12.8	79.0					
4	241	15.0	12.1	80.7	Mean	....	....	13.1	82.7

TABLE XXIII.—*Showing analyses of six sets of ten beets each of Plat No. 3.*

[Date: October 27.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1.....	243	15.8	12.3	77.8	5.....	253	16.4	13.4	81.7
2.....	303	16	12.7	79.4	6.....	210	15.6	12.9	82.7
3.....	250	15.8	12.6	79.7					
4.....	273	16.3	13.7	84	Mean.	....	....	12.9	80.9

TABLE XXIV.—*Showing analyses of six sets of ten beets each in Plat No. 4.*

[Date: October 27.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1.....	250	16.4	12.9	78.7	5.....	285	15.5	12.9	83.2
2.....	282	16.5	13.5	81.8	6.....	221	15.7	12.6	80.3
3.....	303	16.0	12.2	76.3					
4.....	289	16.0	12.8	80.0	Mean.	....	....	12.8	80

TABLE XXV.—*Showing analyses of six sets of ten beets each from Plat No. 5.*

[Date: October 28.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1.....	350	16.6	12.8	77.1	5.....	343	15.7	12.4	79
2.....	357	16.4	12.6	76.8	6.....	282	15.9	12.2	76.7
3.....	355	15.3	12.2	79.7					
4.....	377	16.6	12.8	77.1	Mean.	....	....	12.5	77.7

TABLE XXVI.—*Showing analyses of six sets of ten beets each from Plat No. 6.*

[Date: October 28.]

No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.	No.	Average weight beets.	Solids in juice.	Sucrose in juice.	Purity.
	Grams.		*Per cent.*			*Grams.*		*Per cent.*	
1.....	243	16.4	13.6	82.9	5.....	293	15.4	12.2	79.2
2.....	255	16.5	13.3	80.6	6.....	243	15.7	12.5	79.6
3.....	288	16.0	12.6	78.8					
4.....	325	16.6	13.6	81.9	Mean.	....	....	12.9	80.5

MISCELLANEOUS.

PROCESS FOR THE PRODUCTION OF SUGAR-BEET SEED BY CUTTINGS.

Andreas Nowoczek, of Kaaden, Bohemia, has patented a process in Germany for the production of improved sugar-beet seed by cuttings from the mother beet. The process consists in taking the buds from the axis of the leaves and cutting them out with as little as possible of the flesh of the beet adhering thereto. These buds are treated with an antiseptic to prevent them from decay and to prevent the ground worms from eating them. The material chosen for the antiseptic is powdered charcoal. These buds are planted in beds and produce beets of average size which, it is claimed, have all the properties of the mother beet from which they were taken. The beets as produced can be planted for seed in the usual way. It is claimed for the process that the excellent qualities of the mother beet are much better preserved by this method than by the usual method of planting it for seed directly.

LETTER FROM MR. HENRY T. OXNARD ON THE PROSPECTS OF THE BEET-SUGAR INDUSTRY IN THE UNITED STATES.

GRAND ISLAND, NEBR.,
November 7, 1891.

DEAR SIR: I esteem it a pleasure and an honor to be able to write a few words briefly regarding the development of the beet-sugar industry and the condition in which it exists in the United States to-day. The beet-sugar industry has become well established in Europe only within the last half century, and has become a great factor in the world's sugar supply within the past fifteen years, so that to-day more sugar is produced from beets than from all the other sugar-producing plants of the world combined. This result has been brought about within the last fifty years by the Governments of Europe, chiefly Germany and France, subsidizing and encouraging the production of sugar to such an extent as to diminish the price of that article at least one-half what it was ten years ago. The United States, as you well know, has, within the past year, by a wise provision of the McKinley bill, offered a bounty of 2 cents per pound for a limited period for all sugar produced in the United States, and by following the example of Germany and France can soon hope to become independent of the rest of the world for the supply of its sugar, thereby keeping at home some hundreds of millions of dollars sent abroad annually to enrich the farmers and manufacturers of foreign countries. The 2 cents given in the shape of a bounty by the United States Government takes the place of the 2 cents which formerly existed as a tariff on the importation of sugar. The result of this legislation is, that the price of sugar since the law went into effect has fallen 2 cents per pound, the consumer paying just 2 cents less than a year ago, and at the same time the development of the home industry has not been sacrificed, but encouraged, and that is not the only advantage we shall derive, as each factory, similar to the one we have built here, means an outlay of about half a million dollars, and the United States will require about a thousand of such factories to supply it with sugar in 1900. The building of these factories will start up the coal and iron mines as well as the ma-

chine shops all over the United States, giving employment directly to thousands, and give a far greater impetus to our national prosperity than could be obtained in any other channel. We will also give our farmers an opportunity to diversify their crops, and we all know the advantage to be derived from that source. Under the old tariff the industry never thrived, but with the stimulus of the bounty, within the past eight months, beet-sugar factories have started or are about to be started all over the United States. At least twenty States are, in my opinion, well adapted to the sugar beet. We have the soil, climate, and capital necessary to become the greatest sugar-producing country in the world, and as soon as we have acquired the knowledge of the industry which will enable us to compete successfully with those countries of Europe, with the aid of the stimulus given by our last Congress, we can hope to lead the world in the production of sugar in the next fifteen or twenty years.

But the supply of the home article is not the only advantage to be gained. I refer to the effect of the beet crop on the soil. Properly carried on the cultivation of the sugar beet is greatly beneficial to all other agriculture. The deep and careful cultivation which the beet requires greatly improves the land, the soil becoming thereby deepened and the disintegration and solution of the mineral constituents greatly accelerated. The tap root of the beet descends to a great depth, loosening the soil which most other plants fail to reach. The nourishment thus obtained passes partly into the leaves and is left with them on the ground at the time of harvest, and to-day in Europe the farmers are anxious to plant beets, as they find their next crop grown on the same soil is increased 33 per cent. The pulp, after the sugar is removed, makes an excellent food for fattening cattle, and can be sold to the farmers for little or nothing after paying them liberally for the privilege of extracting the sugar.

We have in operation this fall three beet-sugar factories, each with a capacity of 300 tons of beets daily, besides which each factory uses about 50 tons of coal and 40 tons of limestone daily, spending in the immediate neighborhood of the factory each and every day upwards of $2,000 amongst the farmers for the beets and laborers working in the factory, keeping that amount at home which formerly found its way to the pockets of the European farmers and laborers. This large sum is distributed in the community immediately surrounding each one of our factories, and the result has been to build up the towns where our factories are located as well as the surrounding farming district; these towns in turn build up the State. Since the establishment of our factories in each community where situated the demand for labor has so far exceeded the supply that not a single individual wishing to work has lacked the opportunity of finding remunerative employment either in the field or factory. The Oxnard Beet Sugar Company, located at Grand Island, Nebr., was built and operated for a short time last year, working very satisfactorily. This year our company has built two new factories, locating them at Norfolk, Nebr., and Chino, Cal. Both of these factories commenced operations for the first time this year and are now turning out a standard grade of fine white granulated sugar which sells readily in competition with the sugars offered by the large refineries. We expect to manufacture 9,000,000 pounds of granulated sugar in our three factories this year. Besides ours there are three other beet-sugar factories at present in operation, and the number will be largely increased next year, spreading all over the northern and central portion of the United States. It is with pleasure that I can inform you, after a very careful study of the subject and practical trial of same, that a most brilliant future and speedy development awaits this new industry.

I remain, very sincerely and respectfully yours,

HENRY T. OXNARD.

Hon. J. M. RUSK,
Secretary of Agriculture.

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BULLETINS OF THE DIVISION OF CHEMISTRY,

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No. 1. An Investigation of the Composition of American Wheat and Corn. Edited by Clifford Richardson. 1883. Pp. 69. (Out of print.)

No. 2. Diffusion: Its Application to Sugar Cane, and Record of Experiments with Sorghum in 1883. Edited by H. W. Wiley. 1884. Pp. 36. (Out of print.)

No. 3. The Northern Sugar Industry: A record of its progress during the season of 1883. Edited by H. W. Wiley. 1884. Pp. 120. (Out of print.)

No. 4. An Investigation of the Composition of American Wheat and Corn. (Second report.) Edited by Clifford Richardson. 1884. Pp. 98. (Out of print.)

No. 5. The Sugar Industry of the United States. Edited by H. W. Wiley. 1885. Pp. 224. (Out of print.)

No. 6. Experiments with Diffusion and Carbonatation at Ottawa, Kans. Campaign of 1885. Edited by H. W. Wiley. 1885. Pp. 20. (Out of print.)

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No. 8. Methods and Machinery for the Application of Diffusion to the Extraction of Sugar from Sugar Cane and Sorghum, and for the use of Lime and Carbonic and Sulphurous Acids in Purifying the Diffusion Juices. Edited by H. W. Wiley. 1886. Pp. 85. (Out of print.)

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No. 16. Methods of Analysis of Commercial Fertilizers, Feeding Stuffs, and Dairy Products. Adopted at the Fourth Annual Convention of the Association of Official Agricultural Chemists, August 16, 17, and 18, 1887. Edited by Clifford Richardson. 1887. Pp. 80. (Out of print.)

No. 17. Record of Experiments Conducted by the Commissioner of Agriculture in the Manufacture of Sugar from Sorghum and Sugar Canes at Fort Scott, Kans., Rio Grande, N. J., and Lawrence, La., 1887-'88. Edited by H. W. Wiley. 1888. Pp. 118.

No. 18. Sugar-producing Plants: Record of Analyses made by Authority of the Commissioner of Agriculture under direction of the Chemist, 1887-'88 (Sorghum—Fort Scott, Kans., Rio Grande, N. J.; Sugar Cane—Lawrence, La.), together with a study of the data collected on Sorghum and Sugar Cane. Edited by H. W. Wiley. 1888. Pp. 132.

No. 19. Methods of Analysis of Commercial Fertilizers, Cattle Foods, Dairy Products, Sugar, and Fermented Liquors. (Adopted at the Fifth Annual Convention of the Association of Official Agricultural Chemists, held at the U. S. Department of Agriculture August 9 and 10, 1888.) Edited by Clifford Richardson. 1888. Pp. 96. (Out of print.)

U. S. DEPARTMENT OF AGRICULTURE

DIVISION OF CHEMISTRY

BULLETIN No. 36

EXPERIMENTS

WITH

SUGAR BEETS

IN

1892

BY

HARVEY W. WILEY

Chemist of the U. S. Department of Agriculture and Director of the Department Sugar Experiment Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida, and Sterling and Medicine Lodge, Kansas

WITH THE COLLABORATION OF

Dr. WALTER MAXWELL

Assistant in Charge of the Schuyler Station

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CONTENTS.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., December 31, 1892.

SIR: I have the honor to transmit, for your inspection and approval, the manuscript of Bulletin No. 36 of the Division of Chemistry, being a report on the experiments with sugar beets, conducted by your authority under my direction, during the season of 1892.

Pursuant to your directions, in accordance with my request the Entomologist, Dr. C. V. Riley, has supplied me with his report on the sugar-beet web worm, as prepared by him for the Annual Report of the U. S. Department of Agriculture for 1892, which is of special interest in connection with the present bulletin.

Respectfully,

H. W. WILEY,
Chemist.

Hon. J. M. RUSK,
Secretary of Agriculture.

EXPERIMENTS WITH SUGAR BEETS IN 1892.

Following in the line of the work of last year, sugar-beet seed of high grade imported from Europe was distributed to persons who had asked for samples. The distribution was made in the early spring of 1892. Four thousand pounds of seed were distributed in 8,159 packages, which were sent to 2,316 addresses, making an average of nearly four packages to each address. Each package was accompanied with printed instructions for preparing the soil, planting the seed, and cultivating the beets. Printed directions were also sent for taking samples for analysis, accompanied with shipping tags for franking the samples to the Department laboratory. Special duplicate shipping tags were sent to the persons who received seed in Nebraska, with the request to send duplicate samples to the experiment station at Lincoln for examination.

SUGAR-BEET SEED DISTRIBUTED.

The number of packages sent to each State and the number of persons to whom sent in each State and Territory are given in the following list:

State.	Packages distributed.	Persons receiving seed.	State.	Packages distributed.	Persons receiving seed.
Alabama	2	2	Montana	96	13
Arizona	11	2	Nebraska	730	93
Arkansas	64	63	Nevada	45	1
California	203	29	New Hampshire	3	3
Colorado	600	65	New Jersey	2	2
Connecticut	26	2	New Mexico	4	4
District of Columbia	30	1	New York	92	24
Florida	2	2	North Carolina	4	4
Georgia	2	2	North Dakota	186	42
Idaho	28	9	Ohio	1,103	335
Illinois	467	212	Oklahoma	8	8
Indiana	713	168	Oregon	112	24
Indian Territory	1	1	Pennsylvania	9	9
Iowa	598	204	South Carolina	13	4
Kansas	261	141	South Dakota	322	72
Kentucky	5	5	Tennessee	4	4
Louisiana	1	1	Texas	43	14
Maine	4	4	Utah	61	2
Maryland	6	6	Vermont	6	6
Massachusetts	6	3	Virginia	114	21
Michigan	579	178	Washington	191	46
Minnesota	614	232	West Virginia	39	7
Mississippi	3	3	Wisconsin	664	223
Missouri	60	23	Wyoming	31	7

The samples for analysis began to arrive at the laboratory in the latter part of September and continued to be received until the 20th of December, when further work in analysis of samples was suspended for the purpose of tabulating and classifying the results.

RESULTS OF ANALYSIS OF BEETS RECEIVED.

In the following tables are given the results of the analyses of the samples by counties and States, together with the average composition of the samples received from each State:

ARKANSAS.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		*Ounces.*	*Per cent.*	*Per cent.*		*Pounds.*
17090	Mrs. R. J. Cawood	Rogers	Benton	Nov. 3	....	Nov. 8	2	5	15.8	10.78	71.8	....
16850	J. A. Harr	Fairmont	Prairie	Oct. 1	....	Oct. 10	1	17	14.9	8.11	57.3	....
16851	......do	......do	......do	Oct. 1	....	Oct. 10	1	13	15.1	9.32	64.9	....
	Average			....	....	....	......	15	15.0	8.72	61.1	....
	Average of State			....	....	....	......	12	15.3	9.41	64.7	....

CALIFORNIA.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17204	William Shartel	Fort Bidwell	Modoc	Nov. 10	....	Nov. 22	2	19	21.9	16.14	77.6	....
16842	J. W. Smith	San Luis Obispo	San Luis Obispo	Sept. 26	17.206	Oct. 4		11	17.6	12.77	76.4	3,028
16843	C. R. Callender	Los Berros	......do	...do	15.296	Oct. 4	1	18	19.0	15.15	83.9	3,509
17007	....do	....do	......do	Oct. 21	15.246	Oct. 31	1	8	21.5	14.80	72.3	2,946
	Average			....	15.916	....	......	12	19.4	14.24	77.5	3,161
	Average of State				15.916	....	......	14	20.0	14.72	77.6	3,161

COLORADO.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17066	David Pirkins	Abbott	Arapahoe	Oct. 10	....	Oct. 31	2	42	25.0	16.74	70.4	....
17026	Wm. Claussen	Newton	......do	Oct. 27	....	Nov. 1	2	36	15.7	11.49	77.0	....
	Average			....	....	....	......	39	20.4	14.12	73.7	....
16839	G. F. Breninger	Table Rock	El Paso	Sept. 27	11.761	Oct. 3	2	12	19.0	14.07	78.0	2,331
16840	....do	....do	......do	Sept. 27	12.197	Oct. 3	2	12	19.9	14.66	77.6	2,505
16935	....do	....do	......do	....	12.196	Oct. 24	2	13	18.9	13.18	73.4	2,130
	Average			....	12.051	....	......	12	19.3	13.97	76.3	2,322
16833	Colorado Agricultural Experiment Station.	Fort Collins	Larimer	Sept. 27	7.620	Oct. 3	2	3	20.5	15.40	79.0	1,673
16834	......do	......do	......do	Sept. 27	10.450	Oct. 3	2	8	19.5	14.78	79.7	2,222

16835	......do	......do	......do	Sept. 27	9.150	Oct. 3	2	9	21.9	16.63	80.0	2,198
16862	......do	......do	......do	Oct. 6	8.168	Oct. 12	2	9	20.1	16.13	84.5	2,008
16863	......do	......do	......do	Oct. 6	21.344	Oct. 12	2	20	19.6	15.16	81.4	4,755
16864	......do	......do	......do	Oct. 6	18.295	Oct. 12	2	26	18.1	14.42	83.9	3,996
16865	......do	......do	......do	Oct. 6	18.518	Oct. 12	2	18	20.0	16.50	86.9	4,792
16866	......do	......do	......do	Oct. 6	15.246	Oct. 12	2	9	22.5	19.37	90.6	4,830
16867	......do	......do	......do	Oct. 6	11.108	Oct. 12	2	11	22.0	18.59	89.0	3,317
16933	A. T. Gilkison	......do	......do	Oct. 15	21.393	Oct. 24	2	19	22.6	18.39	85.6	6,933
16934	......do	......do	......do	Oct. 15	....	Oct. 24	2	25	19.9	16.05	84.9	....
16956	Agricultural College Experiment Station.	......do	......do	Oct. 20	10.890	Oct. 25	2	11	20.2	16.52	86.1	2,797
17115	W. A. Gunn	Timnath	......do	Oct. 26	....	Nov. 9	2	21	17.7	13.23	78.7	....
17195	N. R. Faulkner	Loveland	......do	Nov. 1	....	Nov. 21	2	19	19.5	15.02	81.1	....
17196	......do	......do	......do	Nov. 1	....	Nov. 21	2	19	17.7	13.38	79.6	....
17210	A. T. Gilkison	Fort Collins	......do	Nov. 15	21.562	Nov. 25	2	18	22.0	17.98	86.0	6,020
17211	......do	......do	......do	Nov. 15	23.958	Nov. 25	2	20	23.6	19.13	85.4	7,063
17212	Fred Oldenburgh	Loveland	......do	....	....	Nov. 27	2	30	21.7	16.46	79.9	....
17219	Colorado Agricultural Experiment Station.	Fort Collins	......do	Dec. 1	....	Dec. 6	2	7	23.6	18.90	84.3	....
	Average			....	15.439	....	......	16	20.7	16.42	83.5	4,046
16815	F. A. Huntley	Rocky Ford	Otero	Sept. 19	20.500	Sept. 24	2	15	20.4	15.86	81.8	4,801
16854	......do	......do	......do	Oct. 4	24.829	Oct. 10	2	19	16.9	12.35	76.9	4,256
16876	A. Nichols	......do	......do	Oct. 1	13.068	Oct. 13	1	18	18.3	12.99	74.7	2,287
16877	Lewis Swink	......do	......do	Oct. 3	21.780	Oct. 13	1	14	20.0	15.71	82.7	5,105
16878	......do	......do	......do	Oct. 7	23.022	Oct. 13	1	14	18.7	15.03	84.6	5,286
16879	G. W. Swink	......do	......do	Oct. 9	....	Oct. 14	1	20	19.5	15.76	85.5	....
16880	......do	......do	......do	Oct. 9	21.562	Oct. 14	1	14	24.0	20.40	89.4	7,098
16881	......do	......do	......do	Oct. 9	....	Oct. 14	1	11	18.6	14.76	84.4	....
16882	......do	......do	......do	Oct. 9	19.166	Oct. 14	1	18	22.2	18.02	86.0	5,359
16883	......do	......do	......do	Oct. 9	19.166	Oct. 14	1	12	21.9	17.82	86.4	5,324
16884	J. M. Biggs	La Junta	......do	Oct. 8	16.117	Oct. 14	2	14	24.4	20.28	87.8	5,183
16885	James McNean	......do	......do	Oct. 9	14.810	Oct. 14	2	15	20.4	15.87	82.3	3,492
16889	G. W. Swink	Rocky Ford	......do	Oct. 11	19.166	Oct. 15	1	9	19.1	14.41	80.2	3,998
16890	......do	......do	......do	Oct. 11	20.908	Oct. 15	1	11	17.5	13.76	83.7	4,349
16893	F. A. Huntley	......do	......do	Oct. 10	....	Oct. 15	2	30	18.3	13.99	81.4	....
16894	......do	......do	......do	Oct. 10	....	Oct. 15	2	34	12.9	9.17	76.0	....
16895	......do	......do	......do	Oct. 10	23,304	Oct. 15	2	23	16.8	12.65	79.3	4,213
16896	......do	......do	......do	Oct. 10	....	Oct. 15	2	26	17.7	13.53	80.5	....
16897	......do	......do	......do	Oct. 10	24.393	Oct. 15	2	25	18.6	15.09	85.4	5,673
16899	G. W. Swink	......do	......do	Oct. 14	15.682	Oct. 18	1	19	15.0	11.42	81.3	2,628
16909	J. L. Terwilliger	La Junta	......do	Oct. 10	....	Oct. 19	4	33	15.8	10.64	72.5	....
16910	G. W. Swink	Rocky Ford	......do	Oct. 14	13.068	Oct. 19	1	15	17.5	13.11	79.8	2,467
16911	......do	......do	......do	Oct. 14	13.939	Oct. 19	1	13	18.5	14.08	81.0	2,871
16912	......do	......do	......do	Oct. 14	20.909	Oct. 19	1	14	18.9	14.74	82.1	4,567
16913	......do	......do	......do	Oct. 14	18.295	Oct. 19	1	12	17.9	13.93	81.9	3,765
16914	......do	......do	......do	Oct. 14	15.682	Oct. 19	1	12	18.2	13.55	78.3	3,005
16915	......do	......do	......do	Oct. 15	18.294	Oct. 19	1	19	18.1	13.46	78.3	3,480
16916	Lane Brothers	......do	......do	Oct. 15	13.722	Oct. 19	1	13	20.0	16.09	84.7	3,378
16917	......do	......do	......do	Oct. 15	15.682	Oct. 19	1	14	20.3	16.44	85.3	3,971
16918	......do	......do	......do	Oct. 15	....	Oct. 19	1	10	16.9	13.02	81.1	....

COLORADO—Continued.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		*Ounces.*	*Per cent.*	*Per cent.*		*Pounds.*
16931	A. Nichols	Rocky Ford	Otero	Oct. 15		Oct. 22	1	18	15.9	11.34	75.1	
16932	do	do	do	Oct. 15		Oct. 22	1	15	15.9	11.37	75.3	
16936	Dock Seaman	do	do	Oct. 19		Oct. 24	1	26	19.3	14.66	79.9	
16937	do	do	do	Oct. 19		Oct. 24	1	23	20.6	16.23	82.9	
16938	F. A. Huntley	do	do	Oct. 20	18.730	Oct. 24	2	15	22.2	17.93	85.0	5,151
16939	do	do	do	Oct. 20		Oct. 24	2	28	18.1	13.94	81.0	
16962	W. E. Anderson	do	do	Oct. 19		Oct. 26	1	14	18.5	15.08	85.1	
16988	Frank Day	La Junta	do	Oct. 15	17.500	Oct. 29	1	11	18.9	14.87	82.8	3,889
16989	M. F. Lindsley	do	do	Oct. 15	20.000	Oct. 29	1	22	17.5	13.53	81.3	4,884
16990	Adair & Son	Rocky Ford	do	Oct. 22		Oct. 29	1	12	19.0	13.95	77.2	
16991	do	do	do	Oct. 22		Oct. 29	1	19	18.6	13.74	77.7	
17039	J. C. Kain	do	do	Oct. 28		Nov. 3	2	19	19.6	14.10	75.7	
17040	George Nallows	Catlin	do	Oct. 25	6.098	Nov. 3	1	18	16.1	11.42	74.7	939
17048	Board of Trade	La Junta	do			Nov. 4	1	16	20.9	14.11	71.1	
17049	do	do	do			Nov. 4	1	18	20.7	14.90	75.7	
17050	Ole Sorenson	Fowler	do	Oct. 29		Nov. 4	1	23	19.5	15.02	81.1	
17078	J. W. Fertig	La Junta	do	Nov. 1		Nov. 7	1	20	17.1	12.07	74.3	
17079	S. H. Fertig	do	do	Nov. 2	18,000	Nov. 7	1	17	18.7	13.82	77.8	3,492
17080	J. B. Looper	do	do	Oct. 28		Nov. 7	1	19	20.0	15.67	82.5	
17081	L. C. Swink	Rocky Ford	do	Nov. 1		Nov. 7	1	18	18.4	15.27	87.3	
17082	John Fisher	do	do	Nov. 1	13.403	Nov. 7	1	14	20.2	16.25	84.7	3,319
17083	C. D. Williams	do	do	Nov. 1	23.653	Nov. 7	1	17	16.8	12.83	80.4	4,394
17093	Prof. F. A. Huntley	do	do	Nov. 3		Nov. 8	2	20	17.1	13.19	81.2	
17094	do	do	do	Nov. 3		Nov. 8	2	20	19.0	14.17	78.5	
17095	do	do	do	Nov. 3		Nov. 8	2	20	18.7	15.08	84.9	
17096	do	do	do	Nov. 3		Nov. 8	2	22	18.2	14.42	83.4	
17097	do	do	do	Nov. 3		Nov. 8	2	18	18.8	14.93	83.6	
17098	do	do	do	Nov. 3		Nov. 8	2	24	16.5	12.66	80.8	
17099	do	do	do	Nov. 3		Nov. 8	2	22	12.2	8.11	70.0	
17100	A. C. Comer	do	do	Nov. 3	8.712	Nov. 8	1	19	18.6	14.76	83.5	1,938
17114	Wm. Green	do	do	Oct. 15	15.159	Nov. 9	1	29	16.4	13.03	83.7	2,983
17128	L. Hartig	Fowler	do	Nov. 6	20.000	Nov. 12	1	11	16.5	12.14	77.5	3,396
17129	do	do	do	Nov. 6	20.000	Nov. 12	1	20	20.6	16.19	82.4	4,816
17130	Fred Janko	do	do	Oct. 30		Nov. 12	1	35	20.3	15.38	79.8	
17146	A. D. Best	Rocky Ford	do	Nov. 5	21.780	Nov. 14	1	17	21.6	15.02	73.2	4,326
17147	J. R. Moore	do	do	Nov. 6	15.681	Nov. 14	1	13	15.4	11.27	77.0	2,456
17151	B. N. Dye	do	do	Nov. 8		Nov. 15	1	26	18.5	14.53	82.6	
17152	Noris Dye	do	do	Nov. 8		Nov. 15	1	24	19.0	13.77	76.3	
17153	Edy Swink	do	do	Nov. 9	17.424	Nov. 15	1	24	19.7	15.83	84.6	4,213
17154	William Swink	do	do	Nov. 9	20.909	Nov. 15	1	23	19.5	15.80	85.3	5,085
17155	David Best	do	do	Nov. 10	20.037	Nov. 15	1	18	19.5	15.70	84.8	4,813
17156	C. H. Allen	La Junta	do	Nov. 10	16.503	Nov. 15	2	20	20.6	16.77	85.7	4,281
17157	W. B. Smith	Rocky Ford	do	Nov. 11	20.909	Nov. 16	1	15	21.8	16.14	77.9	4,742

17158	do	do	do	Nov. 11		Nov. 16	1	30	19.8	14.17	75.4	
17170	G. W. Swink	do	do	Nov. 12		Nov. 18	1	14	18.7	14.15	79.6	
17171	do	do	do	Nov. 12		Nov. 18	1	14	20.2	16.16	84.2	
17172	do	do	do	Nov. 12		Nov. 18	1	18	17.3	13.12	79.8	
17173	do	do	do	Nov. 12		Nov. 18	1	21	17.7	13.20	78.5	
17174	do	do	do	Nov. 12		Nov. 18	1	17	20.1	15.67	82.0	
17175	do	do	do	Nov. 12		Nov. 18	1	13	19.5	14.88	80.3	
17176	do	do	do	Nov. 12		Nov. 18	1	15	18.5	14.30	81.4	
17181	do	do	do	Nov. 13		Nov. 19	1	18	18.6	14.29	80.9	
17182	do	do	do	Nov. 14		Nov. 19	1	16	19.1	15.64	86.2	
17183	James Guthey	do	do	Nov. 14		Nov. 19	1	16	19.2	16.32	89.5	
17184	do	do	do	Nov. 15		Nov. 19	1	18	20.5	17.19	88.2	
17185	Derald Guthey	do	do	Nov. 14		Nov. 19	1	20	20.5	18.00	92.4	
17186	do	do	do	Nov. 14		Nov. 19	1	15	20.3	17.16	89.0	
17188	G. W. Swink	do	do	Nov. 16		Nov. 21	1	19	15.7	11.07	74.2	
17189	do	do	do	Nov. 16	24.393	Nov. 21	1	15	18.9	14.32	79.7	5,025
17190	do	do	do	Nov. 16	23.522	Nov. 21	1	20	19.4	15.39	83.5	5,457
17191	do	do	do	Nov. 16	20.037	Nov. 21	1	16	19.5	13.74	74.2	3,687
17192	do	do	do	Nov. 16	20.909	Nov. 21	1	16	20.0	15.81	83.2	4,964
17193	S. H. Pollock	do	do	Nov. 4		Nov. 21	1	16	22.5	18.32	85.2	
17194	do	do	do	Nov. 4		Nov. 21	1	15	21.8	17.82	86.1	
17216	G. W. Swink	do	do	Dec. 1		Dec. 5	1	14	20.2	15.52	80.9	
17218	do	do	do	Dec. 1	24.394	Dec. 6	1	15	21.4	16.54	81.4	5,923
	Average				18.583			18	18.9	14.61	81.4	4,146
17092	J. B. Traxler	Lamar	Prowers	Nov. 3	20.691	Nov. 8	1	16	14.9	10.96	77.4	3,029
16817	M. E. Bashor	Monte Vista	Rio Grande	Sept. 21	15.200	Sept. 26	1	13	16.9	14.08	87.1	3,365
16818	do	do	do	Sept. 21	15.200	Sept. 26	1	13	16.6	13.55	85.3	3,171
	Average				15.200			13	16.8	13.82	86.2	3,268
	Average of State				17.581			18	19.1	14.82	81.7	3,998

IDAHO.

17086	H. T. Eames	Almo	Cassia	Oct. 20		Nov. 7	2	34	19.5	14.65	79.1	

ILLINOIS.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar yield per acre.
					Tons.	1892.		Ounces.	Per cent.	Per cent.		Pounds.
17071	Frank D. Gardner	Champaign	Champaign	Nov. 4	10.454	Nov. 7	2	10	15.7	11.58	77.7	1,614
17072	do	do	do	Nov. 4	8.712	Nov. 7	2	9	16.4	12.52	80.4	1,584
17208	do	do	do	Nov. 19	7.950	Nov. 25	2	8	17.8	12.63	74.7	1,355
17209	do	do	do	Nov. 19	7.950	Nov. 25	2	6	20.6	15.86	81.0	1,844
	Average				8.767			8	17.6	13.15	78.5	1,599
16944	Eli C. Fisk	Havana	Mason	Oct. 21	12.132	Oct. 25	3	17	12.3	8.20	70.2	1,259
16945	do	do	do	Oct. 21	12.132	Oct. 25	1	24	12.7	8.89	73.7	1,436
16946	do	do	do	Oct. 21	12.132	Oct. 25	5	17	13.1	8.88	71.4	1,390
17029	do	do	do	Oct. 28	15.630	Nov. 1	4	9	13.2	7.80	62.2	1,369
17030	do	do	do	Oct. 28	12.197	Nov. 1	4	17	16.3	12.02	77.6	2,054
17031	do	do	do	Oct. 28	12.632	Nov. 1	4	19	15.2	10.81	74.9	1,847
17032	do	do	do	Oct. 28	8.712	Nov. 1	2	18	14.6	10.37	74.8	1,219
17033	do	do	do	Oct. 28	8.712	Nov. 1	2	16	15.6	10.52	71.0	1,174
17112	do	do	do	Nov. 5	9.148	Nov. 9	5	18	14.0	9.88	74.3	1,213
17113	do	do	do	Nov. 5	9.148	Nov. 9	5	18	13.8	9.33	71.2	1,098
17162	do	do	do	Nov. 5	10.890	Nov. 17	6	14	14.5	10.37	75.3	1,535
17163	do	do	do	Nov. 5	10.890	Nov. 17	6	19	14.3	10.05	73.9	1,459
	Average				11.196			17	14.1	9.77	72.9	1,421
17055	Howard Carl	Joliet	Will	Nov. 2	11.979	Nov. 5	2	14	17.6	13.29	79.5	2,286
17222	Floyd Smith	Harrison	Winnebago	Oct. 28	21.018	Dec. 10	2	11	18.4	13.61	77.9	4,023
	Average of State				11.246			15	15.3	10.93	75.2	1,653

INDIANA.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar yield per acre.
16816	W. A. Horrall, M. D	Washington	Daviess	Sept. 15		Sept. 24	2	23	11.9	7.65	66.9	
16837	R. D. Stotts	Euclid	do	Sept. 25	15.246	Oct. 3	2	11	17.5	10.98	66.1	1,997
	Average				15.246			17	14.7	9.32	66.5	1,997

17044	James M. Lewis	Vilas, Owen County. (*See* Owen County.)	Green	Oct. 31	12.415	Nov. 3	1	4	18.5	13.47	76.6	2,312
17200	Rev. Edward W. Fisher	Corydon	Harrison	Nov. 8	....	Nov. 21	3	6	16.0	10.54	69.4	....
17201	......do	......do	......do	Nov. 8	....	Nov. 21	3	7	15.7	10.51	70.4	....
	Average						......	7	15.9	10.53	69.9	....
17133	A. D. Ogborn	Newcastle	Henry	Oct. 25	16.335	Nov. 12	2	10	19.9	14.21	75.2	3,149
16800	Andrew Gietl	Rensselaer	Jasper	Sept. 2	16.300	Sept. 12	1	13	10.8	3.99	38.9	456
16801	......do	......do	......do	Sept. 7	14.800	Sept. 12	1	7	15.7	10.55	70.7	1,992
16919	Nelson Morris (Chicago, Ill.)	Demotte	......do	Oct. —	8.000	Oct. 19	30	8	16.0	12.18	80.1	1,408
16976	......do	......do	......do	Oct. 24	8.000	Oct. 26	1	14	18.6	14.75	88.8	1,891
16977	......do	......do	......do	Oct. 24	8.000	Oct. 26	1	10	17.4	13.77	83.2	1,654
16978	......do	......do	......do	Oct. 24	8.000	Oct. 26	1	16	18.2	14.77	83.4	1,821
16979	......do	......do	......do	Oct. 24	8.000	Oct. 26	1	17	16.4	12.89	82.7	1,541
	Average			....	10.157	....	......	12	16.2	11.85	75.4	1,538
16929	W. J. Mummah	Warsaw	Kosciusko	Oct. 12	....	Oct. 22	2	17	15.2	10.75	74.5	....
16930	......do	......do	......do	Oct. 12	....	Oct. 22	2	25	14.0	9.71	73.0	....
17004	A. T. Cook	......do	......do	Oct. 24	....	Oct. 31	2	18	16.3	11.09	71.6	....
	Average						......	20	15.2	10.52	73.0	....
16820	James M. Lewis	Vilas (*See* Green Co.)	Owen	Sept. 22	....	Sept. 26	1	21	11.7	6.82	61.3	....
17134	Alpha Langston	Dublin	Wayne	Oct. 28	....	Nov. 12	1	18	19.6	13.41	72.0	....
	Average of State			....	11.510	....	......	14	16.1	11.23	72.5	18.22

IOWA.

17110	W. J. Grunewald	Blairstown	Benton	Oct. 22	....	Nov. 9	5	41	14.6	10.65	76.8	....
17111	......do	......do	......do	Oct. 22	....	Nov. 9	8	14	14.0	10.02	75.4	....
	Average						......	28	14.3	10.34	76.1	....
16987	Knud Bodholt	Newell	Buena Vista	Oct. 25		Oct. 29	1	42	15.8	12.04	80.2	....
16841	Adam Scholl	Murray	Clarke	Oct. 1	....	Oct. 4	2	20	10.5	5.53	55.4	....
16986	J. W. Stewart	Illyria	Fayette	Oct. 24	10.454	Oct. 29	2	18	16.2	12.71	82.6	1,980
16847	A. Snyder	Center Point	Linn	Oct. 5	....	Oct. 8	2	30	13.7	9.94	76.4	....
16941	......do	......do	......do	Oct. 18	....	Oct. 24	2	42	15.8	11.62	77.4	....
	Average			....		....	......	36	14.8	10.78	76.9	....

IOWA—Continued.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		*Ounces.*	*Per cent.*	*Per cent.*		*Pounds.*
16886	Eugene A. Hoge	James	Plymouth	Oct. 10	10.890	Oct. 14	2	36	13.3	10.19	80.7	1,616
17024	B. T. Seaman	Davenport	Scott	Oct. 25	18.000	Oct. 31	2	13	15.4	10.43	71.3	2,416
17025	do	do	do	Oct. 26	21.000	Oct. 31	2	18	16.1	10.91	71.3	2,948
	Average				19.500			15	15.8	10.67	71.3	2,682
17205	Ole Throndson	Callender	Webster	Nov. 7		Nov. 23	2	6	20.3	16.20	84.0	
	Average of State				15.086			24	15.1	10.93	76.2	2,240

KANSAS.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17214	H. H. Grover	Eldorado	Butler	Nov. 15		Dec. 3	2	20	19.8	12.58	66.9	
16900	Thos. B. Clark	Pfeifer	Ellis	Oct. 13		Oct. 18	2	61	14.1	9.36	70.9	
16807	P. W. Conyers	Garden City	Finney	Sept. 16	13.700	Sept. 21	1	11	15.8	9.57	68.1	1,611
16808	do	do	do	Sept. 16	13.700	Sept. 21	1	12	18.2	13.46	77.6	2,584
17005	do	do	do	Oct. 20		Oct. 31	2	34	15.5	10.80	73.3	
	Average				13.700			19	16.5	11.50	73.0	2,098
16860	Thomas Brown	Salem	Jewell	Oct. 8	12.197	Oct. 12	1	38	15.4	10.99	75.1	1,817
16861	do	do	do	Oct. 8	13.068	Oct. 12	1	37	16.0	11.57	76.1	2,075
	Average				12.638			37	15.7	11.28	75.6	1,946
16823	F. L. Frazey	Nickerson	Reno	Sept. 26	19.300	Sept. 29	1	36	15.7	11.17	74.2	2,887
16824	do	do	do	Sept. 26	18.000	Sept. 29	1	36	16.4	11.41	73.2	2,714
	Average				18.650			36	16.1	11.29	73.7	2,800
16827	T. K. Davis	Wherry	Rice	Sept. 27		Sept. 30	1	34	14.9	10.59	74.8	
16828	do	do	do	Sept. 27		Sept. 30	1	37	10.9	6.67	63.4	
16830	Joseph Hanschild	do	do	Sept. 28		Oct. 1	1	42	13.3	9.58	75.3	
16831	do	do	do	Sept. 28		Oct. 1	1	21	13.5	9.44	73.6	
	Average							34	13.2	9.07	71.8	
17089	Michael Streckfus	Salina	Saline	Nov. 1		Nov. 7	2	28	20.6	15.59	79.7	

16948	H. O. Peck	Wellington	Sumner	Oct. 18		Oct. 25	1	20	15.2	10.52	72.9	
16949	do	do	do	Oct. 18		Oct. 25	1	10	15.7	11.53	77.3	
16950	do	do	do	Oct. 20		Oct. 25	1	9	15.3	11.92	81.3	
16951	do	do	do	Oct. 20		Oct. 25	1	13	15.7	11.76	78.8	
	Average							13	15.5	11.44	77.7	
	Average of State				14.994			25	15.7	11.07	74.2	2,281

KENTUCKY.

16803	W. H. Lyon	Pulaski	Pulaski	Sept. 14	18.700	Sept. 21	2	12	12.8	9.79	80.5	2,659
16804	do	do	do	Sept. 14	16.300	Sept. 21	2	14	11.4	7.93	73.4	1,712
	Average				17.500			13	12.1	8.86	77.2	2,186

MICHIGAN.

16904	Henry Reinhard	Salzburg	Bay	Oct. 12		Oct. 19	1	37	13.7	10.36	80.8	
16905	William Reuther	do	do	Oct. 12		Oct. 19	1	73	10.2	5.42	57.1	
16906	do	do	do	Oct. 12		Oct. 19	2	33	14.3	10.29	76.1	
16965	T. H. McGraw and Co., per A. W. H. Lenders.	Portsmouth	do	Oct. 20	23.305	Oct. 26	2	17	17.5	13.58	81.1	4,628
16966	do	do	do	Oct. 20		Oct. 26	2	17	17.1	14.24	87.7	
16967	do	do	do	Oct. 20		Oct. 26	2	18	18.1	14.83	86.2	
16968	do	do	do	Oct. 20		Oct. 26	2	18	17.5	13.61	81.9	
16969	do	do	do	Oct. 21	23.958	Oct. 26	2	15	17.5	14.17	85.2	5,223
16970	do	do	do	Oct. 21	19.275	Oct. 26	2	18	16.3	13.36	86.2	4,009
16971	do	do	do	Oct. 21	20.255	Oct. 26	2	20	18.1	14.83	86.2	4,675
16972	do	do	do	Oct. 21	16.385	Oct. 26	2	16	19.1	15.59	85.9	3,962
16973	do	do	do	Oct. 21	20.038	Oct. 26	2	18	15.1	13.21	91.4	4,404
16974	do	do	do	Oct. 21	21.671	Oct. 26	2	16	18.1	14.64	85.1	4,872
16975	do	do	do	Oct. 21	15.464	Oct. 26	2	16	18.7	15.61	87.8	3,826
16999	do	do	do	Oct. 22	12.088	Oct. 29	2	14	18.8	14.50	81.2	2,567
17000	do	do	do	Oct. 22	11.543	Oct. 29	2	11	18.6	15.07	85.3	2,678
17001	do	do	do	Oct. 22	17.206	Oct. 29	2	18	16.9	13.69	84.8	3,579
17002	do	do	do	Oct. 22	13.504	Oct. 29	2	16	17.4	13.79	83.4	2,801
17003	do	do	do	Oct. 22	12.632	Oct. 29	2	13	18.1	13.95	81.1	2,579
17120	do	do	do	Oct. 22	13.177	Nov. 11	2	14	18.9	15.29	85.1	3,094
17121	do	do	do	Oct. 22	17.750	Nov. 11	2	15	20.7	15.62	79.5	3,980
17122	do	do	do	Oct. 22	11.761	Nov. 11	2	16	20.7	16.86	85.7	3,067
17123	do	do	do	Oct. 22	19.275	Nov. 11	2	15	21.3	18.13	89.6	5,651
17124	do	do	do	Oct. 24	15.464	Nov. 11	2	20	19.9	16.46	87.0	4,000
17125	do	do	do	Oct. 24	12.850	Nov. 11	2	12	19.5	15.76	85.0	3,107
17126	do	do	do	Oct. 24	17.642	Nov. 11	2	19	19.3	15.21	83.0	4,022
17127	do	do	do	Oct. 24	12.305	Nov. 11	2	15	19.5	16.07	86.7	3,096
	Average				16.550			20	17.8	14.22	84.1	3,801

MICHIGAN—Continued.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		*Ounces.*	*Per cent.*	*Per cent.*		*Pounds.*
17164	Elliston Warner	Quincy	Branch	Oct. 24	6.643	Nov. 17	1	11	15.6	11.03	74.4	984
17165	do	do	do	Oct. 24	8.657	Nov. 17	1	14	14.5	10.14	73.6	1,165
	Average				7.650			13	15.1	10.59	74.0	1,075
17069	Asa W. Slayton	Grand Rapids	Kent	Oct. 27	18.622	Nov. 7	2	19	17.4	13.35	80.7	3,620
17070	do	do	do	Oct. 27	20.745	Nov. 7	2	20	18.7	14.84	83.6	4,639
	Average				19.684			20	18.1	14.20	82.1	4,130
17159	Franz, Zoche	Washington	Macomb	Nov. 1		Nov. 16	2	18	17.8	13.09	77.4	
17067	J. M. Longyear	Marquette	Marquette	Oct. 28	24.611	Nov. 7	2	23	19.3	15.63	85.2	5,916
17068	do	do	do	Oct. 28	24.611	Nov. 7	2	34	20.1	16.48	86.3	6,360
	Average				24.611			29	19.7	16.06	85.8	6,138
17132	Geo. Minkel	Mecosta	Mecosta	Nov. 7		Nov. 12	2	23	18.1	14.69	85.4	
17041	E. A. Ellis	Bridgeport	Saginaw			Nov. 3	3	4	18.6	14.80	83.8	
	Average of State				16.720			19	17.8	14.11	83.4	3,796

MINNESOTA.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17059	Gilbert Guttersen	Lake Crystal	Blue Earth	Oct. 22		Nov. 5	2	26	16.4	10.85	69.6	
16952	W. D. Japs	Carver	Carver	Oct. 20		Oct. 25	2	20	15.5	11.54	78.4	
16953	do	do	do	Oct. 20		Oct. 25	2	25	15.6	12.19	82.2	
	Average							22	15.6	11.87	80.3	
16926	Carl Johnson	Chisago City	Chisago	Oct. 18		Oct. 22	2	20	17.3	13.13	79.8	
17225	C. B. Kittnedge	Glyndon	Clay	Oct. 10		Dec. 19	2	28	20.8	16.16	81.8	
17226	do	do	do	Oct. 10		Dec. 19	2	25	21.4	17.30	85.1	
	Average							26	21.1	16.73	83.5	

16812	F. C. Meade, jr.	Alexandria	Douglas	Sept. 20	6.900	Sept. 22	4	14	16.9	13.91	82.3	1,426
16855	do	do	do	Oct. 4	12.196	Oct. 10	4	13	17.5	14.40	86.6	2,767
	Average				9.548			14	17.2	14.16	84.5	2,097
16852	W. E. Poe	Cannon Falls	Goodhue	Oct. 6	15.246	Oct. 10	2	15	14.2	9.49	70.3	1,836
17144	J. E. Bosworth	Money Creek	Houston	Oct. 28	19.536	Nov. 14	1	43	16.9	12.31	76.7	3,329
17145	do	do	do	Oct. 28	16.932	Nov. 14	1	29	16.5	13.40	85.4	3,495
	Average				18.234			36	16.7	12.86	81.1	3,412
17060	C. W. Sargent	Woodstock	Pipestone	Oct. 20		Nov. 5	2	43	10.6	5.89	58.5	
16983	Herman Prahl	Renville	Renville	Oct. 25		Oct. 29	2	27	17.1	12.63	77.7	
17150	Hans Halverson	Tyrol	Stearns	Nov. 2		Nov. 15	2	47	15.6	10.42	70.3	
16887	Milo Camp	Morris	Stevens	Oct. 10	19.601	Oct. 14	1	12	17.5	13.30	80.0	3,763
16888	do	do	do	Oct. 10	19.601	Oct. 14	1	15	18.2	14.23	82.3	4,644
	Average				19.601			14	17.9	13.77	81.2	3,954
17109	Axel Kap	Eagle Bend	Todd	Oct. 6		Nov. 9	4	29	16.4	11.78	75.6	
16982	(*)	Lake City	Wabasha			Oct. 29	10	19	18.1	14.18	80.3	
16954	C. P. Lundstad	Lawndale	Wilkin	Oct. 20		Oct. 25	1	37	15.3	12.16	83.6	
16955	O. O. Varholdt	do	do	Oct. 20		Oct. 25	1	36	16.4	12.89	82.7	
	Average							37	15.9	12.53	83.2	
17045	B. M. Sacreiter	Utica	Winona	Oct. 20		Nov. 4	1	51	14.0	8.20	61.6	
17046	do	do	do	Oct. 20		Nov. 4	1	57	12.9	7.38	60.2	
	Average							54	13.5	7.79	60.9	
	Average of State				15.716			29	16.4	12.17	78.1	2,966

MISSOURI.

16998	W. T. Tummond	Kirksville	Adair			Oct. 29	2	47	13.9	8.94	67.7	
17187	Melchior Regh	Concordia	Lafayette			Nov. 21	11	18	12.9	7.24	5.91	
	Average of State							33	13.4	8.09	63.4	

* No name on description. The name Joseph Lobban appears on a copy of paper wrapped around the sample.

MONTANA.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		Ounces.	Per cent.	Per cent.		Pounds.
16925	John Rohner	Rohner	Lewis and Clarke	Oct. 13		Oct. 20	6	22	15.8	10.93	72.8	

NEBRASKA.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17062	F. McCoy	Alliance	Boxbutte	Oct. 27		Nov. 5	3	11	21.6	16.93	82.5	
17084	E. G. Bower	Butte	Boyd	Oct. 20	21.780	Nov. 7	1	30	18.2	14.54	84.1	4,805
17085	do	do	do	Oct. 20	21.780	Nov. 7	1	31	21.3	16.44	81.3	5,253
	Average				21.780			31	19.8	15.49	82.7	5,029
17118	H. A. Vedder	Sparks	Cherry	Nov. 4	5.445	Nov. 11	2	9	21.8	17.10	82.5	1,386
16813	Fremont Tribune	Fremont	Dodge	Sept. 17	20.000	Sept. 23	2	23	14.7	10.61	76.0	2,912
16814	do	do	do	Sept. 17	20.000	Sept. 23	2	20	13.2	9.50	75.7	2,596
17008	do	do	do			Oct. 31	2	28	18.6	11.12	62.8	
	Average				20.000			24	15.5	10.41	71.5	2,754
17131	Anton Krause	Ohiowa	Fillmore	Nov. 1	14.000	Nov. 12	1	33	18.3	13.85	79.7	2,789
16858	J. T. Green	Dustin	Holt	Oct. 7	10.018	Oct. 12	2	12	20.9	15.98	80.5	2,326
16859	do	do	do	Oct. 7	9.157	Oct. 12	2	11	21.5	17.76	86.9	2,551
	Average				9.588			12	21.2	16.87	83.7	2,439
17061	C. F. Haase	Norfolk	Madison	Oct. 22		Nov. 5	5	13	22.1	17.53	83.5	
16984	O. C. E. Robinson	Indianola	Red Willow	Oct. 13		Oct. 29	1	30	18.2	13.81	79.9	
16985	do	do	do	Oct. 13		Oct. 29	1	36	18.5	13.47	76.6	
	Average							33	18.4	13.64	78.3	
17102	D. F. Noyes	Falls City	Richardson	Nov. 4	17.424	Nov. 8	1	16	15.7	11.08	74.3	2,589
17103	do	do	do	Nov. 4	17.424	Nov. 8	1	16	16.7	12.61	79.4	3,150
	Average				17.424			16	16.2	11.85	76.9	2,870
	Average of State				15.703			21	18.8	14.15	79.3	3,036

NEVADA.

17135	R. H. McDowell	Reno	Washoe	Nov. 5	12.175	Nov. 12	8	17	17.9	14.38	84.6	2,674
17136	......do	......do	......do	Nov. 5	13.231	Nov. 12	8	15	19.6	15.88	85.3	3,236
17137	......do	......do	......do	Nov. 5	12.088	Nov. 12	8	17	18.9	15.61	86.9	2,959
17138	......do	......do	......do	Nov. 5	12.110	Nov. 12	16	11	19.0	16.11	88.7	3,122
17139	......do	......do	......do	Nov. 5	14.157	Nov. 12	9	12	19.7	16.88	90.2	3,893
17140	......do	......do	......do	Nov. 5	10.513	Nov. 12	8	7	19.0	16.75	90.3	2,867
17141	......do	......do	......do	Nov. 5	7.187	Nov. 12	8	8	18.7	15.85	89.2	1,834
17142	......do	......do	......do	Nov. 5	13.721	Nov. 12	8	13	19.0	16.11	88.7	3,537
17143	......do	......do	......do	Nov. 5	12.698	Nov. 12	8	13	18.6	15.94	90.2	3,294
	Average				11.987			13	18.9	15.92	83.4	3,046

NEW MEXICO.

16838	H. B. Ashenfelter	Maxwell City	Colfax	Sept. 27	8.276	Oct. 3	2	5	24.5	19.01	81.7	2,321
17042	......do	......do	......do	Oct. 28	10.890	Nov. 3	2	11	22.6	19.30	89.9	3,409
17043	......do	......do	......do	Oct. 28	6.098	Nov. 3	2	7	21.3	17.77	87.8	1,717
17087	......do	......do	......do	Nov. 1	5.009	Nov. 7	2	9	19.5	15.43	83.3	1,162
17088	......do	......do	......do	Nov. 1	7.187	Nov. 7	2	11	20.4	16.92	87.3	1,916
17107	......do	......do	......do	Nov. 3	12.197	Nov. 9	2	20	19.6	16.02	86.0	3,035
17108	......do	......do	......do	Nov. 3	8.276	Nov. 9	2	15	18.8	15.82	88.8	2,099
	Average				8.276			11	21.0	17.18	86.1	2,237
17177	Chas. W. Greene	Eddy	Lincoln			Nov. 19	4	21	15.0	10.31	72.3	
17178	E. S. Motten	......do	......do			Nov. 19	3	26	18.7	13.27	74.7	
17179	Geo. Blankenship	......do	......do			Nov. 19	3	36	16.9	12.22	76.1	
17180	G. O. Shield	......do	......do			Nov. 19	3	42	16.4	12.66	81.3	
	Average							31	16.8	12.11	75.9	
	Average of Territory				8.276			19	19.4	15.34	83.2	2,237

NEW YORK.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		*Ounces.*	*Per cent.*	*Per cent.*		*Pounds.*
17224	M. F. Pierson	Seneca Castle	Ontario	Nov. 5	19.602	Dec. 19	2	10	1.0	16.92	84.8	5,081
17065	E. S. Sterling	Eagle Harbor	Orleans	Oct. 20		Nov. 7	2	31	18.6	15.03	85.1	
17223	Alphonse Friedrick	Baldwins, L. I	Queens	Oct. 30		Dec. 15	2	31	18.5	15.22	86.6	
16356	Daniel A. Lynn	Branchport	Yates	Oct. 6	11.102	Oct. 10	2	16	17.5	14.54	87.5	2,549
	Average of State				15.352			22	18.9	15.43	85.9	3,815

NORTH CAROLINA.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
16825	C. N. Spowbour	Salem	Forsyth	Sept. 27	2.500	Sept. 30	2	4	12.2	8.69	75.0	295
16826	do	do	do	Sept. 27	4.600	Sept. 30	2	4	13.5	9.29	71.7	554
	Average				3.550			4	12.9	8.99	73.4	425

NORTH DAKOTA,

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17019	William A. McLean	Tower City	Cass	Oct. 13		Oct. 31	2	28	18.2	13.53	78.2	
17073	do	do	do	Oct. 13		Nov. 7	2	28	22.6	16.45	76.6	
	Average							28	20.4	14.99	77.4	
16819	George Oliver	Crary	Ramsey	Sept. 20		Sept. 26	1	21	15.9	11.26	74.5	
16943	H. L. Van Ornum	Forman	Sargent	Oct. 18		Oct. 24	2	20	16.4	11.69	75.0	
16907	Roger Allin	Grafton	Walsh	Oct. 12	22.216	Oct. 19	2	27	16.3	12.06	78.8	3,812
16908	do	do	do	Oct. 12	22.651	Oct. 19	2	22	16.8	12.17	77.0	3,828
	Average				22.434			25	16.6	12.12	77.9	3,820
	Average of State				22.434			24	17.7	12.86	76.5	3,820

OHIO.

17197	H. G. Cartmell	Springfield	Clarke	Nov. 14		Nov. 21	3	17	14.9	9.33	65.9	
17198	Solomon Pence	Eagle City	do	Oct. 9		Nov. 21	3	27	14.8	10.69	76.0	
	Average							22	14.9	10.01	71.0	
17217	W. P. Wolf	Wilmington	Clinton	Nov. 18		Dec. 5	5	15	19.4	14.15	76.8	
16963	D. S. Gilmore	Wilson's Mills	Cuyahoga	Oct. 24		Oct. 26	1	21	13.8	10.17	77.5	
17036	Fred Whitcomb	Winameg	Fulton	Oct. 25	19.820	Nov. 2	2	17	16.7	12.69	80.0	36.34
17037	E. P. Ames	do	do	Oct. 24		Nov. 2	2	21	16.2	13.00	84.4	
	Average				19.820			19	16.5	12.85	82.2	36.34
16844	H. A. Andrews	Findlay	Hancock	Sept. 28	11.326	Oct. 5	2	18	15.7	10.74	72.0	15.81
16845	do	do	do	Sept. 28	6.752	Oct. 5	2	25	14.4	9.68	70.7	8.35
16920	Jacob Zeller	Mount Cory	do	Oct. 14		Oct. 20	3	17	16.8	12.21	73.5	
16921	do	do	do	Oct. 14		Oct. 20	3	18	17.8	14.02	84.0	
17010	Geo. W. Brown	McComb	do	Oct. 20		Oct. 31	2	41	18.5	13.47	76.7	
17038	Paul R. Bierdeman	Findlay	do	Oct. 31		Nov. 2	2	16	16.5	11.31	72.1	
17119	John Nelson	McComb	do	Nov. 2		Nov. 11	2	18	20.2	15.30	79.7	
17199	do	do	do	Nov. 17		Nov. 21	2	29	16.7	12.50	78.8	
	Average				9,039			23	16.8	12.42	77.8	12.08
16940	Fred Gehringer	Napoleon	Henry	Oct. 19		Oct. 24	2	27	15.1	10.93	76.2	
17011	A. J. Tompkins	Bellevue	Huron	Oct. 26		Oct. 31	2	35	17.0	13.56	83.9	
17160	F. E. Fitch	do	do	Oct. 29	13.939	Nov. 16	2	25	15.8	11.71	78.0	2,297
17161	do	do	do	Oct. 29		Nov. 16	2	37	18.0	13.22	77.3	
	Average				13.939			32	16.9	12.83	79.7	2.297
16964	Conrad Spanner	Ironton	Lawrence	Oct. 5		Oct. 26	2	15	13.8	8.53	65.1	
16853	R. C. Bradford	Dayton	Montgomery	Oct. 3		Oct. 10	4	11	14.3	10.60	78.1	
16857	Samuel Benner	Miamisburg	do	Oct. 10	17.142	Oct. 12	2	10	14.4	9.63	70.4	2,098
17012	Henry Beach	do	do	Oct. 26		Oct. 31	2	19	16.8	12.18	76.3	
17013	do	do	do	Aug. 9		Oct. 31	2	19	13.1	8.04	64.6	
17014	Samuel Benner	do	do	Oct. 25	18.513	Oct. 31	2	17	16.3	11.18	72.2	2,695
17015	Capt. D. W. Young	do	do	Aug. 9		Oct. 31	2	21	12.7	8.52	70.7	
17016	do	do	do	Sept. 10		Oct. 31	2	30	13.3	9.28	73.4	
17074	P. J. Meng	do	do	Oct. 29		Nov. 7	2	19	18.5	13.47	76.6	
	Average				17.878			18	14.9	10.36	73.2	2,397
16902	S. Curtis	Pagetown	Morrow	Oct. 3		Oct. 19	1	22	15.3	10.11	70.5	
16903	do	do	do	Oct. 3		Oct. 19	1	30	15.6	9.49	64.9	

OHIO—Continued.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		*Ounces.*	*Per cent.*	*Per cent.*		*Pounds.*
17206	S. Curtis	Pagetown	Morrow	Oct. 25	13.068	Nov. 23	2	15	19.7	14.91	79.7	2,802
17207	do	do	do	Oct. 26	12.850	Nov. 23	2	10	18.3	14.45	73.1	2,449
	Average				12.959			19	17.2	12.26	75.1	2,626
17075	Paul Weedmann	Paulding	Paulding	Oct. 22		Nov. 7	3	29	16.0	12.07	79.4	
17076	Alex. Harper	do	do	Oct. 24		Nov. 7	3	22	17.9	13.00	76.4	
17077	Sam'l Croven	do	do	Oct. 27	24.398	Nov. 7	3	25	15.9	10.83	71.7	3,421
	Average				24.398			25	16.6	11.97	75.8	3.421
17053	James W. Hays	Piketon	Pike	Oct. 26	24.829	Nov. 5	2	13	17.1	11.37	70.0	3,565
17054	do	do	do	Oct. 27	14.819	Nov. 5	2	7	16.1	10.77	70.4	2,026
	Average				19.870			10	16.6	11.08	70.2	2,796
17051	C. O. Hale	Ira	Summit	Oct. 25		Nov. 4	1	20	13.0	7.43	60.2	
17052	do	do	do	Oct. 25		Nov. 4	1	24	15.3	9.60	66.0	
	Average							22	14.2	8.52	63.1	
16957	H. M. White	Grand Rapids	Wood	Oct. 22	4.356	Oct. 25	2	7	18.2	15.10	87.3	1,036
17017	do	do	do	Oct. 25	6.970	Oct. 31	2	11	17.4	13.85	83.8	1,461
17018	do	do	do	Oct. 25		Oct. 31	2	24	17.2	13.26	81.2	
17213	G. W. Barnes	Weston	do	Nov. 1		Nov. 27	2	52	15.4	11.27	77.0	
	Average				5.663			24	17.1	13.37	82.3	1,240
	Average of State				14.521			21	16.1	11.62	76.0	2,300

OREGON.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17105	Stanley T. Woodruff	Philomath	Benton	Nov. 2		Nov. 9	2	10	17.2	13.13	80.3	
17106	Geo. R. Woodruff	do	do	Nov. 2	18.077	Nov. 9	2	6	14.2	10.38	77.0	2,607
	Average				18.077			8	15.7	11.76	78.7	2,607
17215	E. G. Haseltine	Mill City	Marion	Nov. 19		Dec. 3	3	15	19.6	14.51	77.9	

16821	Joseph M. Standley	Imbler	Union	Sept. 20		Sept. 28	1	17	20.0	17.82	93.8	
16822	do	do	do	Sept. 20		Sept. 28	1	24	18.5	14.21	80.8	
16871	Wm. Stoop	do	do	Oct. 6	*5.438	Oct. 13	1	17	20.9	15.16	77.1	1,147
16872	do	do	do	Oct. 6	5.438	Oct. 13	1	14	16.9	12.59	80.0	989
16873	Ed. Garn	do	do	Oct. 6	5.438	Oct. 13	1	22	22.3	16.13	76.1	1,204
	Average				5.438			19	19.7	15.18	81.1	1,113
	Average of State				8.598			17	18.7	14.24	80.2	1,487

* Yield as given on blank sent with beets.

PENNSYLVANIA.

16868	John A. McGranahan	Kennard	Mercer	Oct. 13	4.356	Oct. 13	4	11	16.6	13.49	86.5	918
16809	John W. Brant	Pine Hill	Somerset	Sept. 15		Sept. 21	4	14	12.8	8.00	65.0	
	Average of State				4.356			13	14.7	10.75	75.8	918

SOUTH DAKOTA.

17034	David G. Townsend	Plankington	Aurora	Oct. 24	20.175	Nov. 2	2	24	18.8	12.63	70.7	3,552
17035	do	do	do	Oct. 24	19.808	Nov. 2	2	25	17.4	11.64	70.4	2,932
	Average				19.992			25	18.1	12.14	70.6	3,092
16836	S. W. Narregang	Aberdeen	Brown	Sept. 21	20.255	Oct. 3	4	11	22.3	17.24	81.4	5,133
16942	do	do	do	Oct. 14	21.780	Oct. 24	5	12	22.4	16.92	75.0	4,989
16993	do	do	do	Oct. 15	16.988	Oct. 29	6	8	19.9	17.28	90.9	4,818
17202	C. I. Edson	do	do	Oct. 31	18.731	Nov. 22	2	17	19.1	14.45	79.6	3,889
17203	do	do	do	Oct. 31	18.513	Nov. 22	2	18	21.1	15.50	77.3	4,003
	Average				19.253			13	21.0	16.28	81.6	4,566
16806	John W. Kelley	Vandervoort	Clark	Sept. 13		Sept. 21	2	34	14.0	8.34	62.7	
16846	do	do	do	Sept. 28		Oct. 8	2	30	15.7	11.08	74.7	
	Average							32	14.9	9.71	68.7	
16805	Harvey Gunderson	Vermillion	Clay	Sept. 13		Sept. 21	2	25	11.6	7.85	71.2	

SOUTH DAKOTA—Continued.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		Ounces.	Per cent.	Per cent.		Pounds.
16960	A. H. Wallace	Eckard	Fall River	Oct. 18	15.464	Oct. 26	2	10	20.2	13.97	72.7	2,836
16961	do	do	do	Oct. 18	12.197		2	12	22.7	17.76	82.3	3,218
	Average				13.830			11	21.5	15.87	77.5	3,027
16992	Geo. H. Bottcher	Highmore	Hyde	Oct. 14		Oct. 29	2	31	19.1	13.94	76.8	
17020	H. B. Young	do	do	Oct. 20		Oct. 31	1	31	16.6	11.40	72.3	
17021	John Sarvis	do	do	Oct. 15		Oct. 31	1	17	18.7	13.04	73.4	
17022	J. R. Smith	Holabird	do	Oct. 20		Oct. 31	1	13	16.5	10.98	70.1	
17023	John Melbourn	Highmore	do	Oct. 25		Oct. 31	1	18	18.6	13.65	77.3	
17056	C. E. Case	do	do	Oct. 6		Nov. 5	1	17	17.7	12.50	74.4	
	Average							21	17.9	11.59	74.0	
16928	John C. Todd	Iroquois	Kingsbury	Oct. 11		Oct. 22	2	18	16.4	10.39	66.7	
16980	E. Moscrift	Selina	Lincoln	Oct. 18	23.650	Oct. 27	2	39	13.9	9.12	65.2	2,540
16981	do	do	do	Oct. 18	21.560	Oct. 27	2	29	15.8	11.57	72.1	3,245
	Average				22.605			34	14.9	10.35	68.7	2,893
17101	Rev. George B. Reid	Leola	McPherson	Nov. 1	17.206	Nov. 8	5	10	19.2	14.77	81.0	3,634
16891	M. Bohlman	Vilas	Miner	Oct. 11	18.948	Oct. 15	2	16	17.1	12.07	75.2	3,107
16892	do	do	do	Oct. 10	13.503	Oct. 15	2	18	19.6	13.46	73.0	2,404
	Average				16.226			17	18.4	12.77	74.1	2,756
16927	Charles O'Neill	Springs	Potter	Oct. 15		Oct. 22	2	34	16.6	12.26	77.6	
17116	James Naylor, jr	Gettysburg	do	Nov. 1	16.335	Nov. 10	2	14	21.9	16.55	79.5	3,878
17117	do	do	do	Nov. 1	16.335	Nov. 10	2	14	20.9	14.98	75.5	33.36
	Average				16.335			21	19.8	14.59	77.5	3,607
17047	Alice Thomas	Doland	Spink	Oct. 26	6.534	Nov. 4	2	11	16.9	12.59	78.4	1,163
16994	G. R. Hayes	Norfolk	Sully	Oct. 18		Oct. 29	2	23	17.4	11.36	68.7	
16995	do	do	do	Oct. 18		Oct. 29	2	16	22.1	14.54	69.3	
	Average							19	19.8	12.95	69.0	
	Average of State				17.528			20	18.3	13.12	75.5	3,434

TENNESSEE.

16802	A. A. Coventry	Burreville	Morgan	Sept. 12	....	Sept. 21	1	10	13.7	9.42	72.4	....

VIRGINIA.

16874	A. F. Belcher	Burkeville	Nottoway	Oct. 11	8.712	Oct. 13	2	8	16.3	13.08	84.5	1,739
16875	......do	......do	......do	Oct. 11	5.445	Oct. 13	2	8	17.2	13.09	80.1	922
16996	......do	......do	......do	Oct. 27	8.712	Oct. 29	2	6	17.4	13.64	84.4	1,810
16997	......do	......do	......do	Oct. 27	9.583	Oct. 29	2	12	16.2	12.30	79.9	1,700
	Average			....	8.113	....	......	9	16.8	13.11	82.1	1,543
16829	Richard McCoy	Riverton	Warren	....	....	Sept. 30	3	19	11.4	7.81	72.1	....
16959	......do	......do	......do	....	....	Oct. 26	2	20	16.3	11.46	73.9	....
	Average			....	....	....	......	19	13.9	9.64	73.0	....
	Average of State			....	8.113	....	......	12	15.8	11.95	79.6	1,543

WASHINGTON.

17220	John Peters	Waterville	Douglas	....	....	Dec. 7	1	21	19.2	12.50	68.6	....
17221	H. T. Hudson	......do	......do	Oct. 26	13.939	Dec. 7	1	16	19.8	16.24	86.3	3,527
	Average			....	13.939	....	......	19	19.5	14.37	77.5	3,527
17027	John R. Reaves	Spokane	Spokane	Oct. 25	13.068	Nov. 1	1	12	23.2	15.78	71.6	2,666
17028	......do	......do	......do	Oct. 25	13.068	Nov. 1	1	20	21.8	13.69	66.1	2,135
17091	E. H. Morrison	Fairfield	......do	Oct. 25	17.860	Nov. 8	2	9	28.7	22.98	84.3	6,244
17166	John R. Reaves	Spokane	......do	Nov. 11	17.424	Nov. 17	1	25	18.9	13.72	76.4	3,297
17167	......do	......do	......do	Nov. 11	17.424	Nov. 17	1	28	20.9	14.70	74.0	3,419
	Average			....	15.769	....	......	19	22.7	16.17	75.0	3,552
17057	Henry Schütze	Calispell	Stevens	Oct. 22	15.572	Nov. 5	2	9	19.4	15.25	82.7	3,547
17058	......do	......do	......do	Oct. 22	16.335	Nov. 5	2	11	18.8	14.88	83.3	3,656
	Average			....	15.954	....	......	10	19.1	15.07	83.0	3,602

WASHINGTON—Continued.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
					Tons.	1892.		*Ounces.*	*Per cent.*	*Per cent.*		*Pounds.*
16898	George Ruedy	Colfax	Whitman	Oct. 10		Oct. 17	2	8	17.7	13.38	80.5	
16947	M. Schuldhis	Uniontown	do	Oct. 16		Oct. 25	5	17	17.5	12.41	74.6	
17066	F. J. Mahoney	Tekoa	do	Oct. 15		Nov. 7	2	25	19.8	15.04	80.0	
17148	Conrad Tuschaff	Uniontown	do	Nov. 6		Nov. 15	5	34	18.5	11.72	70.5	
17149	do	do	do	Nov. 6	18.513	Nov. 15	5	34	16.0	10.96	72.1	2,640
	Average				18.513			24	17.7	12.70	75.5	2,640
	Average of State				14.320			18	19.9	14.52	76.8	3,113

WEST VIRGINIA.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
17168	J. W. Bishop	Martinsburg	Berkeley			Nov. 18	5	17	18.2	11.87	68.7	
17169	do	do	do			Nov. 18	7	11	16.5	10.71	68.3	
	Average							14	17.4	11.29	68.5	

WISCONSIN.

Serial No.	Name of grower.	Post-office.	County.	Time of harvesting.	Yield per acre.	Date received.	No. of beets.	Average weight.	Total solids.	Sugar in beets.	Purity.	Sugar, yield per acre.
16870	Henry Harbican	Big Patch	Grant	Oct. 9		Oct. 14	1	28	15.0	11.00	78.5	
16810	J. W. Whitehead	Twin Grove	Green	Sept. 18	13.700	Sept. 22	2	7	17.5	13.40	80.1	2,652
16811	do	do	do	Sept. 18	13.000	Sept. 22	2	9	17.0	11.94	73.9	2,067
	Average				13.350			8	17.3	12.67	77.0	2,360
16901	Egbert J. Cable	Markesan	Green Lake	Oct. 13		Oct. 19	2	10	13.7	8.62	69.2	
17104	Frank Williams	Highland	Iowa	Oct. 24		Nov. 8	2	64	16.1	11.11	72.6	
17009	J. W. Johnson	Mauston	Juneau	Oct. 27		Oct. 31	2	31	18.6	14.71	83.2	
16848	W. B. Bell	Dobbston	Langlade	Sept. 25	12.632	Oct. 8	1	18	18.1	13.06	75.9	2,261
16849	do	do	do	Sept. 25	15.464	Oct. 8	1	16	20.1	14.50	75.9	3,071
	Average				14.048			17	19.1	13.78	75.9	2,666

17063	Henry C. Koch	Manitowoc	Manitowoc	Oct. 26		Nov. 7	2	19	17.9	14.34	84.3	
17064	do	do	do	Oct. 26		Nov. 7	2	24	17.4	13.62	82.4	
	Average							21	17.7	13.98	83.4	
16958	Fred Pittman	Arkansaw	Pepin		18.513	Oct. 25	2	24	17.8	14.11	83.4	3.932
16869	David Scott	Rock Elm	Pierce	Oct. 6	23.522	Oct. 13	2	15	16.9	12.08	76.1	3,905
	Average of State				16.139			22	17.2	12.72	77.8	2,981

WYOMING.

16922	M. R. Johnston	Wheatland	Laramie	Oct. 14		Oct. 20	2	8	19.0	14.77	81.8	
16923	do	do	do	Oct. 14		Oct. 20	2	9	19.3	15.99	27.7	
16924	do	do	do	Oct. 14		Oct. 20	2	6	18.1	14.83	86.2	
	Average							8	18.8	15.20	85.2	

DATA OBTAINED FROM THE SEVERAL STATES.

Before proceeding to discuss the data in the preceding tables, attention should be called to the fact that in previous reports of this kind some dissatisfaction has been expressed in some States on account of the poor showing of the samples therefrom. In former reports attention has been particularly called to the fact that the data obtained by this method of experimentation are not wholly reliable and in all cases do not truly represent the capabilities of any locality for beet-sugar production. It is true that a large number of data received from a given State will indicate in a general way whether or not that State is capable of producing a good sugar beet, but where the number of data is limited it may be that the agricultural conditions under which the samples were produced were so poor, or the season so exceptional, as to prevent a fair judgment of the capabilities of the soil and climate. On the other hand, the culture which the samples received may have been so fine and the seasonal conditions so favorable as to produce a beet far above the average which could be produced in the whole State.

Again, the loss of moisture during transportation, or the failure of the farmers to send their beets in as soon as harvested, may tend to reduce the amount of water present in the beet and to raise correspondingly the quantity of sugar therein. Inasmuch as the analyses are made on the expressed juice, this would tend to show always an increased amount of sugar over that present naturally in the beets.

All these disturbing influences must be taken into consideration in judging the data which have been recorded. This has been said in general explanation so as to forestall any criticisms which may be made of the data obtained.

To illustrate more particularly what is meant, attention is called to the instance, say, of Colorado and Montana. From the State of Colorado one hundred and twenty-three samples were received for analysis and from the State of Montana only one sample. Any comparison, therefore, between the average results of the two States would be simply absurd. While one hundred and twenty-three samples from Colorado, showing, as they do, fine possibilities of sugar-beet culture, indicate that the State of Colorado is capable of producing beets of high quality, the single sample from Montana, whether it proved exceptionally poor or exceptionally fine, could have been no criterion by which the capabilities of the State for beet-sugar production could be judged.

In connection with the tentative results which have been obtained by this kind of work should be taken the characteristics of the soil and climate of each locality, and by putting the two together a fairly good idea can be formed of the possibilities of beet-sugar production.

The reader should carefully bear the above explanation in mind, both in looking over the data in the tables and in reading the remarks thereon which follow.

REMARKS ON ANALYSES.

Arkansas.—Number of samples received, 3. The average size of the samples was 12 ounces, and the content of sugar in the beet 9.41. Although Arkansas is farther south than the general experience indicates as a locality for the successful growth of sugar beets, the fact that sugar beets can be grown not only in Arkansas, but in other Southern States, shows the capability of the wide distribution of this plant. There is probably not a State in the Union where sugar beets can not be grown successfully, at least for cattle feeding, and where they can not be grown with a fair content of sugar. It is true that with beets of the richness indicated above it would not be profitable to manufacture sugar. In other words, it would not be profitable in competition with beets of higher quality, yet large quantities of sugar could be made, even from such beets.

California.—Although California is the most promising State for the manufacture of beet sugar in the United States, in so far as the present determination has extended, yet the number of samples received therefrom at the laboratory was very small. Three factories were in operation in California during the past season, viz, the old factory at Alvarado and the factories at Watsonville and Chino. The amount of sugar made at each one, as indicated by the returns filed in the Office of Internal Revenue, is as follows:

	1892.	1891.
	Pounds.	*Pounds.*
Alameda	1, 473, 500	1, 094, 900
Western *	9, 316, 835	4, 340, 556
Chino Valley	7, 903, 541	2, 051, 400

* Up to December 18, 1892, at which time there was still two weeks' work, which would bring the total up to near 10,000,000 pounds.

The beets which were received from the State were of fair size and showed a high content of sugar. In this connection, however, it must be remarked that the beets were long in transit and must have lost a considerable quantity of water. They were somewhat wilted and shriveled in appearance when received. Such beets, of course, would indicate a higher percentage of sugar than they would really contain in a fresh state, and the same remark may be applied to the beets shipped any distance by mail or to beets which have been exposed any considerable time to the air after harvesting, before the determination of the sugar.

Colorado.—Colorado furnished a large number of samples, showing a great interest among the farmers of that State in the culture of the sugar beet. In regard to the content of sugar shown by these samples, the remark made with reference to California must also be made here, viz, that the amount of sugar indicated on analysis is higher than that actually present at the time of harvesting, on account of the loss of water during transportation. Nevertheless, the beets which were received from Colorado must be considered as in every way typical. The average size was just about what a typical sugar beet should have, and the content of sugar and the purity of the juice were in every sense satisfactory.

The experience which has been gained in Colorado and other central Western States situated in the high plateaus of the Rocky Mountains, is such as to lead to the greatest encouragement to the beet-sugar industry in those regions. Especially where irrigation can be practiced, and the climate thus be absolutely controlled, the results from all those localities are of the highest significance. Irrigated land is of course of much higher value, other things being equal, than that which is not irrigated, and hence would be suited to the growth of a crop which would yield high returns. If irrigated land be worth from $100 to $200 per acre it should be planted in a crop which would yield a net profit of from $10 to $20. It is difficult to see how an ordinary cereal crop could be made to yield regularly so high an interest on the investment. In the case of sugar beets it would be easy to secure a crop with an average net profit of the amount mentioned above. The study, therefore, of the results from Colorado is of unusual interest for the reasons above stated.

Idaho.—Only one sample was received from this State. This sample was very much overgrown, the beets being quite double the size of typical beets. Nevertheless the percentage of sugar was very fair although the purity was very low. The beets came, as might be expected, in a badly wilted condition.

Illinois.—The samples from Illinois, eighteen in number, indicate a beet of only fair quality but of very nearly typical size. Evidently, if we regard the conditions of culture as about the same in the different localities, the soil and climate of Illinois are not so well suited to the production of a rich sugar beet as the soil and climate of Colorado.

Indiana.—The soil and climate of Indiana and Illinois are very similar in quality and the number of samples received from each State was the same, viz, 18. The Indiana samples, however, are slightly richer in sugar than those from Illinois. The samples from both States, however, came in a shriveled condition, showing that they had been harvested for some time before being sent in for examination; hence the usual corrections must be made for this cause.

Iowa.—Eleven samples were received from this State, having about the composition of those of Illinois and Indiana.

In general it must be said that such results as are indicated in these tables must be taken for what they are worth and not as typical of what each State can do.

The larger the number of samples, the greater the value which can be placed upon the data. For instance, Colorado with one hundred and twenty-three samples would give much more reliable data than Iowa with eleven samples, especially when we consider that in the report of last year Iowa showed a much larger number of samples and the results were so much better than those indicated by the data of the present season.

Kansas.—Kansas has a peculiarly hot and dry climate, not suited to the conditions of typical beet growth. Nevertheless even in Kansas sugar beets of high sugar content can be produced, as has been indicated by experiments in former years. Eighteen samples were received from this State and these samples were considerably overgrown, being almost one-half larger than typical beets. The average percentage of sugar in the samples received from the State is fairly good, as indicated in the tables.

Kentucky.—Two samples were received from Kentucky and these were of poor quality. It would be extremely unjust to judge of the possibilities of beet production in Kentucky from the samples received.

Michigan.—Thirty-seven samples from the State of Michigan showed an average of rather full size, but with a fine content of sugar. The general results of all the experiments indicate that Michigan is a State peculiarly well suited to the production of rich sugar beets.

Minnesota.—Twenty-two samples from the State of Minnesota showed that the average size of the beets was very much above the normal, while the sugar content was fairly good considering the overgrown condition of the beets examined.

Missouri.—Only two samples were received from this State and these were double the normal size. It would be wholly unjust to judge of the possibilities of Missouri for beet growing by two such samples. There is every reason to believe that the northern part of the State especially is well suited to the growth of beets of high grade.

Montana.—The single sample from Montana (somewhat overgrown) is quite insufficient to give any idea of the possibilities of the State. Montana, being one of the States of high altitude, would doubtless, in proper circumstances, be able to grow beets as rich as those produced in Colorado.

Nebraska.—Two beet-sugar factories have been in operation in Nebraska during the year, viz, at Grand Island and Norfolk. The number

of pounds of sugar made, as indicated by the returns on file in the Office of Internal Revenue, is as follows:

	1892.	1891.
Grand Island	2,110,100	1,415,800
Norfolk	1,698,400	1,318,700

Fifteen samples only were received for analysis in the laboratory, and these were somewhat overgrown, but contained a very high percentage of sugar. The experience of four years has now demonstrated the fact that beets of high sugar content can be grown in Nebraska, and with proper agricultural conditions with a fair tonnage per acre. The study of the data obtained at the experimental station of the department in Nebraska will be given in another part of this report.

Nevada.—Nine samples from the State of Nevada indicated a beet of rather small size, but with a phenomenally large content of sugar. Nevada, with proper irrigation, will doubtless be one of those States in which the culture of the sugar beet will flourish.

New Mexico.—Eleven samples from the Territory of New Mexico showed a beet rather above the average size, but with an extremely high content of sugar. New Mexico also belongs to the region of high plateaus, which under proper agricultural conditions can be made to produce a phenomenally rich beet.

New York.—Only four samples were received from the State of New York. These showed a beet rather above the average size, but with a very high content of sugar.

The capabilities of the culture of the sugar beet are well presented by comparing the data on the State of New York with those from the high plateaus of the Rocky Mountain region. No two climates could be more unlike than those of the Rocky Mountain plateaus and the State of New York, and yet the character of the beets produced in each locality is about the same. Attention has been called in these reports to the advantages of the northern part of New York for beet culture, and while it would be unfair to judge of the capabilities of the State on the analysis of four samples, yet they are sufficient to indicate the character of the beets which can be grown.

North Carolina.—Only two samples were received from this State, and therefore no judgment could be formed of a definite nature concerning it. The samples were very small in size and had a very low content of sugar.

North Dakota.—Six samples only were received from this State, showing beets rather overgrown, but with a fair content of sugar.

Ohio.—Forty-two samples were received from the State of Ohio, showing an average beet above the normal size and with a fair content of sugar. More interest has been shown in Ohio during the past season in regard to the sugar beet than ever before, and attention is called to

the fact that especially in the northern part there are vast areas suitable to the culture of beets, and the climate of northern Ohio is certainly favorable to the production of a high-grade beet.

Oregon.—Eight samples from the State of Oregon showed a beet of average size and fine sugar content, suitable to the economical and profitable production of sugar. Oregon evidently shares with the rest of the Pacific coast those special advantages for beet culture which have already been demonstrated practically in the State of California.

Pennsylvania.—Only two samples were received from this State. They were rather small in size and showed only a moderate content of sugar.

South Dakota.—Thirty samples from the State of South Dakota showed an average beet above the normal size and with a fair content of sugar. South Dakota has so nearly the same advantages for the production of beets as Nebraska that the remarks applied to one State may also be justly applied to the other. The only danger to be feared in beet production in South Dakota would be the advent of an early frost, which would not give sufficient time for the farmer to properly harvest and protect his crop.

Tennessee.—One sample from Tennessee shows a beet below the average size and with a low content of sugar.

Virginia.—Six samples from the State of Virginia showed an average beet rather below the normal in size, but with a fair content of sugar.

Washington.—Fourteen samples from the State of Washington showed a beet of full normal size and with a very high content of sugar. Washington, in common with the rest of the Pacific slope, shows especial advantages for beet culture.

West Virginia.—Two samples from the State of West Virginia show a beet almost of normal size and with a fair content of sugar.

Wisconsin.—The number of samples received from Wisconsin during the past season was much less than usual, due to the fact that the Department did not have the valuable coöperation of the Wisconsin State Experiment Station. The State, however, has been so fully exploited in previous experiments that a continuation of them is hardly necessary to show the great capabilities of it for beet sugar production. Twelve samples of beets showed an average considerably above the normal in weight and with a fair percentage of sugar.

Wyoming.—From the State of Wyoming three samples were received. They were only about half normal size, but extremely rich in sugar. Wyoming possesses the general advantages which have been indicated for Colorado, and on the irrigated lands of the State sugar beets of typical size and high sugar content can be easily grown. The elevated plateaus of Wyoming, when properly irrigated, would doubtless prove more profitable for beet culture than for any other crop.

Utah.—The Territory of Utah has high plateaus capable of irrigation which are well suited to beet culture. One beet-sugar factory is oper-

ated in the Territory, located at Lehi. It is the only factory which at this date (December 31, 1892) has made a full report of its operations to the Commissioner of Internal Revenue. This report follows:

The Utah Sugar Company.

[Season of 1892–'93.]

Date of commencing operations (commenced on sirup of previous year, operating five days), September 1, 1892.

Date of commencing operations on beets of this year, September 26, 1892.

Date of final closing, November 19, 1892.

Actual time that the whole of the machinery was in operation, thirty days and four hours.

Running time, not including the five days first mentioned, thirty-seven days.

Number of employés at factory proper, 110.

Quantity of beets consumed, 9,816 tons.

Acres of beets consumed, 1,090.

Yield in tons of beets per acre, 9.

Average per cent of sugar extracted from beets, 7½.

Average per cent of sucrose in beets, 11.

Total amount of sugar made, 1,473,500 pounds.

Sugar made per ton of beets, 150 pounds.

Sugar made per acre of beets, 1,350 pounds.

Molasses left over from season of 1892, 70,603.72 gallons.

Estimated sugar in molasses left over for further treatment, 183,958 pounds.

Residue of molasses from season of 1891 worked over in 1892, held in tanks, 50,063 gallons.

In averaging the per centum of sugar extracted from beets, the sugar extracted from last year's molasses is included, as the same amount of sugar is left over this season in process of manufacture.

Sugar extracted from last year's molasses, 131,800 pounds.

WORK DONE AT THE DEPARTMENT STATION AT SCHUYLER, NEBR.

The work at the Department station at Schuyler during the present year was carried on for the purpose of determining the best methods for the production of the beets and for a comparative trial of the different standard varieties of beets grown from imported seed.

The rotation work of the station was also inaugurated by the growing of different crops in such a way as to bring once in four years each plat of ground into culture with beets. Wheat and oats were taken as the best crops for beginning the rotation, and some very interesting rotation experiments were made of autumnal-grown wheat, which yielded large crops and at remunerative rates. The experiments in growing wheat sown in the autumn were of particular interest in that locality, where the greater part of the wheat is sown in the spring. It is the intention to prosecute the rotation experiments not only in such a way as to prepare the land thoroughly for the growth of beets, but also incidentally to illustrate the best crops for the locality and the best methods for the culture thereof.

In special work of this kind there is a tendency to overlook the importance of this incidental work. In the growth of sugar beets for com-

mercial purposes there is perhaps no agricultural problem of greater importance than the proper preparation of the land and the proper rotation of crops in order to secure a periodic growth of beets, not only of high tonnage but rich in sugar. More particular attention in succeeding years will be given to this branch of the work.

The importance of this work is especially true for an agricultural community such as that in which the station is situated. It is a community in which the fertilization of the soil is a problem which has entirely escaped the attention of the farmer. Blessed with a virgin soil of the greatest richness the farmer has continued heretofore to harvest his large crops without concerning himself respecting the continual drain which he is making upon his soil.

It has been said in Europe that a beet-sugar factory in any locality is a true agricultural experiment station, and as a result of establishing these factories every branch of agriculture has been immensely benefited. Other crops, such as cereals, potatoes, and grasses, have been made to yield far greater returns as the result of the experiment lessons taught by the beet fields. It is hoped that some such instruction as this may result from the conduct of a beet-sugar experiment station organized upon the plan of the one at Schuyler. In the organization of the station and in the original plan for its operation this point was held constantly in view, and as long as the station remains under its present management it will be the purpose to carry out its work on the lines originally laid down, modifying them from time to time as the exigencies of the circumstances may require and as the experience gained by the work may indicate.

The work of the station last year was under the personal supervision of Mr. Walter Maxwell, who was assisted in the chemical work by Mr. T. C. Trescot. The detailed statement of the work at the station will be found in the report of Mr. Maxwell, which is made a part of this bulletin.

EXPERIMENTS IN THE PRODUCTION OF BEET SEED.

The work of the season commenced during the last week of March. The weather was so severe up to that time as to preclude any possibility of successful investigation. The silos, in which the beets designed for propagation of seed had been preserved through the winter, were opened on the 26th of March. On the 5th of April the work of analyzing the mother beets commenced.

Each of the beets was subjected to separate analysis, a conical piece being bored out of each one of them diagonally in such a way as to secure a sufficient amount of pulp for chemical examination without interfering in any way with the vitality of the beet. Each variety of beets was examined separately. These beets, as indicated in the last report, were selected by physical appearance during the harvest of the preceding year. Those beets which had perfect form and were of the

full weight were selected and preserved. At the time the beets were preserved a sufficient number was taken to form an idea of the character of the whole lot, and this sample was subjected to analysis.

Another selected portion, representing an average sample, was carefully weighed before being deposited in the silo. On the opening of the silos these weighed portions were reweighed, thus showing the actual gain or loss of weight in the beets during their confinement under ground.

Another average sample similar to the one analyzed the preceding fall was also subjected to analysis, thus determining the loss of sugar during the winter.

These two sets of data, viz, the loss of sugar and the gain or loss of weight, together form the data for the corrections to be applied to the analysis of the mother beets so as to express the data arising therefrom in figures which would have been obtained had the analyses been made at the time the mother beets were siloed. The reason for this kind of work is at once apparent.

The object of the analysis of the mother beets is to classify them for the production of seed of different grades. It is therefore necessary to know just what the original condition of the mother beet was in order to know its tendency to produce offspring of a given kind. It would manifestly be unfair to gauge the beets for sugar-producing purposes from the condition in which they are found in the spring, inasmuch as the beet would tend to produce the same character of seed as would have been indicated by its original analysis at the time of storing. Any incidental deterioration during the winter would simply effect the content of sugar and not the potency of the parent to reproduce a seed of a given strength.

The dimensions of the silos in which the beets were preserved, the methods of their structure, and other data connected with the storage of the beets during the winter will be found in the appended report.

The mother beets were analyzed at the rate of four hundred and fifty a day, and only those which were analyzed during the day were taken out of the silo and prepared for analysis.

In regard to the classification of the beets, the following résumé may be given: Each beet was numbered on analysis, and at the close of the day's work they were sorted into classes according to the results of the analytical data. Three grades were made of the beets of each variety.

The poorest grade, numbered 2, consisted of all those beets which, reduced to the condition in which they were at the time of storing, contained from 12 to 16 per cent of sugar in the juice. Of the whole number of mother beets examined 3,567 were included in this classification.

The No. 1 grade consisted of those beets which on the same basis contained from 16 to 18 per cent of sugar. Of the whole number of mothers analyzed 830 fell in this grade.

The highest grade consisted of those beets of extra quality containing 18 per cent of sugar and above. Of this grade a total of thirty-eight was obtained.

The actual loss of sugar in the mother beets from the time of storing, October 15, 1891, to the opening of the silos in April, 1892, was 2.85 per cent, as determined on the average of each variety. On the analysis, therefore, of the mother beet 2.85 per cent was added to the content of sugar actually obtained in order to restore it to its normal composition at the time of harvest. In this way the classification above made was obtained.

The vitality of the mother beets was almost perfect, not more than 20 out of 4,435 failed to grow and produce seed. The cultivation received was simply keeping the weeds down and the ground loose by hand hoeing, of which the crop received three cultivations.

The harvesting of the seed commenced on August 5 on some parts, which were prematurely ripened by the hot weather. The harvesting was finished on the 24th of August, and, as a whole, resulted in the production of seed of fine appearance, great vitality, and excellent yield. The total area under cultivation for seed was 98.3 square rods. The total yield of seed was 595 pounds, or at the rate of 968 pounds per acre. At 15 cents per pound the value of the seed per acre would therefore be $145.20.

The interesting part of the seed-production work will come during the next season, when the home-grown seed will be compared directly with that of foreign importation. It is confidently believed that the seed produced in the locality will have superior qualities in respect of vitality and prepotency over the imported seeds.

At the present time no organized effort has been made in this country to grow high-grade beet seed on a large scale to supply the demands for home consumption. During the past season about 15,000 acres of beets were cultivated in this country. At 15 pounds per acre the amount of seed required to plant this area was 225,000 pounds, and, at 15 cents a pound, the value of this seed was $33,750. Already the item of beet seed is one of considerable importance, and in common practice it may be said that the expense of beet seed for each acre, when properly planted, will be about $2. A great increase in the acreage, therefore, sown to beets would soon create a demand for high-grade seed of home production, which would justify a reasonable amount of capital in entering into the business on a large scale.

EXPERIMENTS IN BEET CULTURE.

The preparation for the crop of 1892 was commenced in October, 1891. The land which was to be planted in beets on the following spring was at that time carefully plowed, and subsoiled to a depth of 16 to 18 inches. The surface of the soil was thus exposed to weathering during the winter. The preparation of the seed bed was commenced on the 24th of April.

The plats designed for the reception of the beet seed were pulverized with a disk harrow to a depth of 4 to 5 inches, and afterwards an ordinary 2-horse harrow was drawn twice over them. After hoeing, the plats were rolled and the seed was then put in with a drill to a depth of from one-half to one inch, and the ground rolled a second time.

The varieties of beets planted were Vilmorin's Improved, Dippe's Kleinwanzlebener, Desprez, Lemaire, Kleinwanzlebener Elite, and Original Kleinwanzlebener. The Knauer variety of seed which was planted in 1890 was not planted in the season of 1892 because the beet seeds ordered from Europe did not reach the station in time. Before planting the seed a test was made of its vitality in a germinating frame. The vitality of the different varieties of seed ranged from 36 to 96 per cent. Some of the seeds had become moist in transportation across the ocean, and the low vitality is perhaps due to this cause.

The first planting was made on the 30th of April and the planting was continued until the 4th of June at various intervals. Details of the planting and cultural work of the season will be found in the report following.

One of the most interesting parts of the work carried on, from a practical point of view, was the determination of the actual expense of growing, harvesting, and delivering to a distance of 3 miles one acre of beets. Accurate account was taken of every hour's work done on this plat, which was charged for at full rates for labor and team. No charge, however, was made for the general supervision.

The ravages of the caterpillar, which will be referred to in detail later on, unfortunately cut the yield of this test acre down to a very low point, and, as will be seen by the details of the work, the actual expense incurred was a little greater than the actual cash received for the beets. This, however, would not have turned out in this way except for the damage done to the crop by the caterpillar mentioned.

The yield of this acre, which was taken for the experiment, was considerably lower than that of any other plat, but had it been only equal to that of the other plats, there would have been a handsome profit.

Specimens of the injurious insect were submitted to the Entomologist for identification. The methods of treatment suggested by him for destroying the insects were also tried.

In general, it may be said that the agricultural work for the season of 1892 was fairly satisfactory in spite of the many adverse conditions which were encountered. The production of a crop averaging nearly 16 tons per acre is certainly satisfactory, especially when, as shown by the details of the work, the production of each ton of beets above 13 per acre is almost clear profit. There is no reason to doubt the ability of good farmers to produce a crop of equal tonnage when growing beets for the factory.

It is true that farmers in some cases may have been misled by statements concerning the profitableness of beet growing. Extreme care

is exercised in the published reports of this Department to avoid mistakes of this kind. On the other hand, discouraging data are not reported by the Department, as has been alleged in some quarters, for the sake of discouraging the industry, but simply for the purpose of presenting to the farmer the actual facts in the case. There is no business, agricultural or otherwise, which can be conducted with uniform success. Failures are always possible and always probable, and the fact that some people fail in a business is no argument whatever against the possibility of others being successful therein.

It is the object of the Department in publishing these cultural data to lay before the farmer who desires such information accurate data on which to base the estimates of his work. It is therefore the purpose of the report not only to be scientifically accurate, but also to present practical information which can be at once utilized by the farmer who does not have the time or the means to make such experiments for himself.

ANALYTICAL DATA.

The work of analyzing the beets grown during the season of 1892 was commenced on the 1st of September. The condition of the crop on September 1 was hardly such as to warrant the beginning of the analytical work. It was far from maturity and in many cases had not recovered from the insect ravages of the summer.

In the publication of the analytical data a departure has been made from the course pursued the last year, in omitting altogether the individual analyses and all analyses by groups of tens or otherwise. The analytical data which are of value are those which are the means of the analyses of any given variety at any given time. Inasmuch as the tabular statements of individual analyses take up an immense amount of space, without subserving any further practical result than to secure a permanent record of the analyses, it has been thought best in the interest of the economy of space to suppress them. Each individual analysis made, however, remains on record on the books of the Department, so that it will not be lost in case it is desired to consult any particular series of results.

The method of examination was based essentially upon that used last year. At each period of examination each plat of beets was gone over in regular order and a definite number selected for analysis. These selections were made in such a way as to represent accurately the average condition of the crop. The whole number of plats was thus gone over and the results tabulated before a second examination was commenced. An effort was made to go over the whole of the plats each week, so as to get a complete weekly record of the progress of the crop toward maturity, and also of the period at which it reached its maximum content of sugar, both in the juice and per acre, and finally toward the end of the season to determine the deterioration to which the crop would be subjected on being left too long in the ground or being sent too tardily to the factory.

Twice during the analytical examinations a measured area of each plat was harvested, so that the average weight of the beets could be determined and the average yield per acre at that time be calculated. The results show that upon the whole there was little variation in the actual content of sugar per acre. In other words, that as the content of sugar in the juice increased the weight of the beet diminished, and *vice versa*.

The beets of last year, as well as of this, were uniformly smaller than the average best sugar beet should be, being only a little over half the size which should be expected of the normal beet. In other words, the beets averaged only a little over 225 grams in weight, whereas a beet averaging 500 grams in weight would, from an agricultural point of view, be far more desirable, while as respects its content of sugar it might show a little less in the juice, but still it would be sufficiently rich for all practical purposes.

A glance at the weights of the beets in the different seasons should be supplemented by a study of the meteorological data, because the varying weight of the average beet was largely a factor of warm and moist weather and dry and cold weather; the dry and cold weather tending to diminish the weight of the beet, and the warm, moist weather tending to increase it.

It is seen, therefore, that there was a minimum in the weight of the beet at the beginning of the season, and that the first maximum was reached along about the end of September, followed by a second minimum near the middle of October and a second maximum near the 1st of November.

In regard to the sugar content of the juice, we find that it was lowest at the middle of November and reached a maximum about the middle of October, showing a gradual decrease in richness until the 18th of November, when the analytical work ceased.

In respect of the purity of the juice, we find it following closely the sucrose content of the juice, showing a minimum purity about the 15th of September and a maximum near the middle of October.

The practical result of this is that the most profitable time for the farmer to harvest his beets in the locality in which these experiments were made, and the most profitable time for the factory to purchase them is about the middle of October. Practically, of course, it is impossible for all of the beets to be delivered at a factory at this time, and there must be some loss both from too early harvesting and too late harvesting, and from keeping the beets in silo until they can be manufactured.

The analytical data gave also some valuable information in regard to the maximum yield of sugar per acre; in other words, the actual sugar produced per acre by each variety at the period of its maximum sugar content.

The Vilmorin Improved variety produced 3,900 pounds per acre.

The Desprez variety produced 4,368 pounds per acre.

The Lemaire variety produced 4,614 pounds per acre.

Dippe's Kleinwanzlebener variety produced 4,800 pounds per acre.

The Kleinwanzlebener Elite variety produced 5,120 pounds per acre.

The Original Kleinwanzlebener variety produced 5,989 pounds per acre.

The difference in the amount of sugar per acre consists chiefly in the tonnage yielded by each variety and not so much in the varying content of sugar. Nevertheless the Original Kleinwanzlebener not only had the largest tonnage per acre, viz, 18.6, but also the highest content of sugar in the juice, viz, 16.1.

The means for all six varieties were as follows:

Mean tonnage per acre	15.8
Mean percentage of sugar in juice	15.1
Mean yield of sugar per acre ..... pounds..	4,800

The mistake should not be made of supposing that the amount of sugar per acre mentioned above is what would be obtained in merchantable form. This represents the actual yield of sugar per acre as grown in the field.

The mean purity of the juice for all the varieties was 79.6.

Had the beets been manufactured by the best approved methods the yield of sugar per acre would have been, approximately, 3,200 pounds.

The comparison of the analytical data obtained during the seasons of 1891 and 1892 shows that in 1891 the mean yield of all the varieties per acre was 21.7 tons, containing 6,060 pounds of sugar; and for 1892 the mean yield of all varieties was 15.8 tons per acre, containing 4,800 pounds of sugar.

Interesting observations were also made on the effect of different methods of preserving beets as respecting their content of sugar. The loss in weight which beets undergo, when transmitted through the mails, has already been noticed. In a special experiment of this kind it was found in a case of a certain number of beets sent from the station at Schuyler to the Department laboratory in Washington, that the loss in weight was accompanied by a corresponding increase in the percentage of sugar in the juice. In other words, when beets are carefully wrapped as indicated in the directions for transmitting to the Department and sent through the mails they suffer no appreciable loss of sugar within the three or four days necessary for their transmission. On the other hand, it has been shown that when beets were harvested and exposed to the sunlight at a time of rather high temperature not only was there a greater loss in weight in four days amounting to as much as 37 per cent, but that also there was an actual loss in the amount of sugar contained in the beets. This loss amounted to about 29 per cent in the time mentioned. When the beets were kept in a shed, the loss in weight was also considerable, due to evaporation, but the loss in sugar was considerably less. When, however, beets were

kept in cold storage or in moist earth the temperature of which was below 40°, it was found that there was practically no loss of sugar during a period of over twenty days. There was a slight loss of moisture in the beets kept in cold storage and a corresponding increase in the amount of sugar in the juice.

In the beets kept in the moist, cold earth at a temperature below 40° but not low enough to freeze them, there was neither loss of weight nor sugar.

The conclusion to be drawn from these interesting experiments is of a practical nature, namely, that in the preservation of beets an attempt should be made to keep them covered with moist earth and at a temperature which should not be allowed, if possible, to rise above 40°.

The idea presents itself here in a very forcible way whether or not it would be profitable for beet-sugar factories to provide cold-storage cellars for the preservation of their beets, in which the temperature could be so regulated as not to be allowed to rise above 40° or fall below 32°. In such a cold-storage cellar the beets could be kept probably for two or three months without any appreciable loss of sugar.

The loss of sugar in beets after they are harvested is doubtless due to the vital processes going on in the organism of the beet. In other words the beet is living off of itself, no longer being connected with the earth and air in such a way as to draw any nourishment from either source. This vitality of the beet is almost completely checked when it is kept at a low temperature and in a dark place, but it is stimulated to the highest extent when it is exposed to a high temperature and a bright light. In other words, the exclusion of heat and light from the organism of the beet will tend to arrest almost completely all the vital action and thus preserve the sugar which nature has stored in the beet as a source of food supply in secondary growth.

The general result of the season's work has shown, first, the effect of the season on the crop, showing as the work has done this year that in the seasonal condition of 1892, even with more favorable culture than was received in 1891, the crop was much less per acre. In the second place, the season's work has shown the danger which may be encountered in this country from an entirely new pest in the form of a caterpillar which is liable to attack the crop in the middle of summer. In the third place, the work has shown practically the best method of storing the beets in order to preserve their sugar content at its maximum. In the fourth place, the method of producing a high-grade beet seed has been thoroughly worked out and the seed produced in this way preserved for future propagation. In the fifth place, the actual cost of producing an acre of beets, when labor is paid for by the day, has been worked out in its minutest detail and the numbers given representing the expense in dollars and cents, may be taken to indicate the maximum cost of the production of an acre of sugar beets by the method indicated. Although the experiments showed, in the given

case, that the actual cost of the beets in money was greater than the actual cash received therefor, yet it was shown that upon the whole station, had it been cultivated in the same way, there would have been a net profit of over $10 per acre.

These reliable data can not fail to be of the utmost interest to the farmer, enabling him to thoroughly foresee the probable cost of the production and the probable income which he will receive from a crop of sugar beets.

REPORT OF ASSISTANT IN CHARGE.

The details of the experimental work at this station are given in the report of Mr. Walter Maxwell, assistant in charge, which is as follows:

U. S. Department of Agriculture,
Division of Chemistry,
Washington, D. C.

Sir: I beg to submit to you the second annual report of the work of the U. S. Department of Agriculture sugar beet experiment station at Schuyler, Nebr., in the year 1892.

Very respectfully,

Walter Maxwell,
Assistant in charge.

Prof. H. W. Wiley,
Director of Station.

The work of the season of 1892, at the sugar beet experiment station, began the last week of March.

On March 26 the silos, in which the beets intended for propagation uses had been preserved through the winter, were examined.

April 5, the work of analyzing the beets which had been preserved in the silos was begun. Mr. T. C. Trescot assisted in the analytical work.

The mode of selection for the mother beets was by examining all of each variety grown at the time of harvesting and taking out from the whole every individual beet whose properties came within the standard of conditions required.

The standard conditions were that the beet should be of the form typical of each variety and of the size approved for propagation purposes. The beet should have a more or less tapering and elongated form, according to the type of the variety, and one leading tap root, which is a graduation of the body of the beet to a point, and and the body of the beet should be free from coarse side roots and inequalities of surface. The foliage system should rest closely upon the body of the beet and without a long and coarse-fleshed neck. In respect of the size, no beet was selected which weighed less than 500 grams or more than 800 grams.

The silos in which the mother beets were preserved were constructed upon a plan embracing precautions against the great fluctuations and lowness of temperature which prevail in this part of Nebraska, and also provision for sufficient ventilation and air replacement in the silos. Each silo was 18 feet long, 5 feet deep, and 6 feet broad at the surface, the breadth tapering to 4 feet at the floor. Over the whole a solid frame roof was placed, which supports a covering of soil 2½ feet thick. Ventilation is secured by six ventilators which are placed three feet from each other, and which rest with lower ends upon the floor of the silo, the upper end protruding one foot above the covering of soil upon the roof. Along, and underneath the floor of the silo an air channel runs, of about a cubic foot in space, which is connected at each end of the silo with air shafts, which, as the ventilators carry off through the roof

the unwholesome and heated air from the interior of the silo, replace the bad air with fresh air from outside. The six ventilators are let into the air channel running under the floor of the silo; consequently as the hot and foul air passes off the replacement with fresh air is immediate and complete. The ventilators are opened and closed as the degree of temperature of the air requires. The beets in the silo were packed in moist sand, each layer of beets being interlaid with an inch layer of sand and not being allowed to touch each other. The use of moist sand was made in compliance with the principle of siloing which includes the securing of a low temperature, in order that growth shall not proceed, and a moist atmosphere, which prevents a loss of moisture from the beet by evaporation; in brief, that the normal conditions of the organism may remain unchanged during the period of storage. The beets were laid up to within 6 inches of the ground surface, the space between the last layer and the roof of the silo being left vacant, the air space acting as a protection against low temperature and also for ventilation.

In order to observe the operation of the mode of siloing with respect to the loss of weight, and incident changes in the organism of the beet, as a consequence of its vitality and of evaporation, a given number of beets, whose weights had been taken, were placed in the middle of the silos and tags attached to each beet bearing the weight. In the spring those beets were reweighed and the change in weight ascertained. Out of ten beets placed thus in the silo only three could be relied upon, the tags upon the others having become so saturated by the moisture that the numbers were no longer legible. The results obtained with the three beets were as follows:

Date.	No. 1 beet.	No. 2 beet.	No. 3 beet.	Total weight.
	Grams.	*Grams.*	*Grams.*	*Grams.*
November 2	800	758	781	2,339
April 8	797	780	768	2,345

There is a difference of behavior observed by the individual beets, but the total result shows a gain of 6 grams in weight, which indicates that no change had taken place, practically, in the water contents of the beets.

The beets had already commenced to shoot at the time that the silos were opened, small, yellow leaves appearing on most of those which were exposed to the faint light admitted through the ventilators. A small loss of sugar was, without doubt, caused by the premature growth which would have been prevented by removing the beets three weeks earlier from the silos and placing them in the earth, the temperature of which was little above the freezing point. The only modification that could have been made with advantage in the control of the silos and mode of preservation was the removal of the beets from the silos in the early part of March instead of the second week in April. The moving of the dense mass in which they were packed and placing the roots in single layer in the cold earth 1 foot from the surface would have deferred even the initial degree of growth which had occurred until the period of "planting out," which is the latter part of April and early May.

In the work of analysis just so many beets as were required for one day (the mean day's work was 450 beets) were taken out of the silo in the morning, the silo being at once closed up and the light shut out. The sample was taken out of each beet with an auger-like sampling machine, the sample consisting of a cone of the size of a man's fore-finger. The pulp is obtained in a finely comminuted condition. The cone or sample is taken from the beet in a diagonal line, the borer entering the beet at its lower end and passing diagonally through towards the top, care being taken that the outer rind of the beet is not punctured and broken through by the instrument. The latter precaution was observed in order that the beet, when planted out in the ground, shall present an intact surface to the weather conditions, and in particular that rain water shall not be able to run into the root.

The sample, is brought into a hand-press and the juice completely expressed. In the extracted juice the sugar content is determined by means of the polariscope.

Each beet is sampled and its richness in sugar determined according to the method given, and the sugar content is made the basis of a division and classification of the beets into grades, which are distinguished from each other by their less or greater richness in sugar. The actual method of classification which was followed is seen from the following details. Each beet is numbered. The juice expressed was placed in a beaker, marked with the same number. The number of the juice was retained through each process of the analysis, and until it was recorded in the book of analyses, with *the per cent of sugar that it contained.* The beets were then classified acording to the data obtained.

After the classification of the beets, which had made up the work of the day, they were immediately placed in the earth, in pits 1 foot deep, and covered with soil to a height of 1½ feet. Each grade of each variety was carefully placed to itself, and the beets were laid in the pits with the heads downwards, in order that they should rest upon the floor of the pit, whose temperature was still nearly at freezing point, and protected from the increasing heat of the mid-day April sun. In those pits the beets remained until taken out for immediate planting.

In stating the analytical results, in the first place, a table will be given showing the actual sugar content of the beets of each variety as they came out of the silos and the mode of variation of the sugar content between the minimum and maximum. Afterwards, the sugar content of the beets at the time of removal from the silos will be compared with the amount of sugar present in the beets at the time that they were taken out of the soil in the previous autumn (October) and at the time when they were placed in the silos for the winter (November).

Table giving the sugar content of the beets of each variety, and the mode of variation of the sugar content between the minimum and maximum.

Variety.	9 per cent.	10 per cent.	11 per cent.	12 per cent.	13 per cent.	14 per cent.	15 per cent.	16 per cent.	17 per cent.	Total beets.
Vilmorin's Improved	38	161	268	295	170	50	4	......	......	986
Dippe's Kleinwanzlebener	37	115	196	245	211	53	8	1	......	866
Desprez	144	337	331	243	78	10	3	......	......	1,146
Lemaire	44	93	127	99	59	8	3	1	......	434
Knauer	58	166	169	128	79	32	4	2	......	638
Kleinwanzlebener Elite	32	72	93	76	50	30	8	3	1	365
										4,435
Rejected beets, or such as contained less than 9 per cent of sugar										445
										4,880

The data contained in the above table give the content of sugar in the beets at the time of their removal from the silos in April. The normal and real sugar content and standard of quality of those beets was the per cent of sucrose found in them by analysis in the previous autumn, and when the crop was at its period of maximum value. But the data in the table given, placed in comparison with the known sugar content of those beets last October, show the loss of sugar which had taken place between the date of harvesting the beets in the autumn and removal from the silos in the spring. And these data are of the first value in studying the results obtained by different modes of autumn and winter preservation, and of observing the period when the greatest loss of sugar takes place.

The mother beets were not placed in the silos at the time of harvesting the crop; they were put into small pits in the field as soon as they were removed from the soil, and they remained in those pits three weeks, after which they were transferred to

the silos for the winter. The following table shows the content of sugar in the beets of each variety as indicated by analysis on the given dates:

Variety.	1891.		1892.
	October 15.	November 6.	April 10.
	Per cent.	*Per cent.*	*Per cent.*
Vilmorin's Improved	14.6	12.9	11.90
Dippe's Kleinwanzlebener	14.5	12.5	12.12
Desprez	14.4	12.5	11.12
Lemaire	14.1	13	11.44
Knauer	14.8	11.6	11.37
Kleinwanzlebener Elite	14.5	12.7	11.86
Means	14.5	12.5	11.65

The above table shows that the sugar content of the mother beets had fallen, between the dates of October 15, 1891, and April 10, 1892, 2.85 per cent. It is likewise observed that the chief loss of sugar took place between October 15 and November 6, the reason of which circumstance will be discussed on a later occasion and in relation with certain other data on the subject.

It has been shown by the latter table that practically a loss of 3 per cent (2.85 per cent) of sugar had taken place in the mother beets between the time of harvest in the autumn and the dates of their removal from the silos in the spring. That amount requires to be added to the sugar content of each beet analyzed in the spring, in order that the normal and real quality shall be understood, and that the actual quality of the several grades, which were planted for the production of seed, shall be clearly established upon the normal sugar content of the beets at the period of maturity in the previous autumn. It is very evident that the sugar content of the beet at the time of full development and ripeness is the actual expression of its standard of quality, since the content of sugar found in the beet in the spring is wholly dependent upon the mode of preservation which has been adopted, and it is possible to treat the beets in a way which would cause a loss of more than one-half of the sugar contained.

The beets of each variety were resolved into three grades of quality, distinguished from each other by the sugar content. The following table gives the normal sugar content of the beets of each grade, with the number of beets of each grade planted:

Variety.	Extra quality beets containing from 18 to 20 per cent.	No. 1 grade beets containing from 16 to 18 per cent.	No. 2 grade beets containing from 12 to 16 per cent.
Vilmorin's Improved	4	220	762
Dippe's Kleinwanzlebener	9	264	593
Desprez	3	88	1,055
Lemaire	4	67	363
Knauer	6	111	521
Kleinwanzlebener Elite	12	80	273
Total	38	830	3,567

The setting out of the mother beets was done on May 4, 5, and 6. The varieties were planted at points on the station field of extreme distance from each other in order to prevent the action of insects in hybridizing. The beets were planted in rows 3 feet apart, with a distance of 2 feet between the beets in the row. The planting was done by hand, the beets being set into the ground at a depth which left the head of the beet level with the surface. The soil was pressed moderately around the beet as it was placed in the hole, care being taken not to damage or break off the young shoots which were making an appearance.

Extremely favorable weather for the mother beets succeeded the time of setting out, and the roots took an almost immediate hold of the ground. In ten days the foliage was 6 inches high, and there were not more than twenty beets out of the 4,435 planted which did not grow and produce seed.

The ground around the beets was kept clean and loose by hand-hoeing, the operation being repeated three times during the season of growth.

The progress of growth was steady and strong up to July 15, at which date the vigor of the crop and the "seed-stand" were magnificent. After that date a period of extremely high temperature set in, which continued almost without a respite up to the end of August, and, with the high temperature, a minimum rainfall was recorded, which combined conditions of weather produced a premature and somewhat irregular ripening of the seed. It was estimated that the seed would be ready for gathering about August 15; but, in consequence of the conditions of the weather described, a first portion of the prematurely ripened was collected on August 5. The first collection was small and somewhat dried up, but had an abundant vitality. The second collection, made from August 12 to 16, was seed of excellent size, weight, and quality. The third and last collection, made from August 20 to 24, was good and of perfect maturity, but hardly so bright in appearance as the second collection.

The seed was gathered by hand, being stripped from the branches of the stand. By making three several collections all the seed was obtained in a perfect condition of maturity. When gathered, the seed was laid out in the sun upon boards and pieces of burlap and thoroughly dried, after which it was separated from particles of leaf and branch by use of a winnowing machine. The winnowing or cleaning process not only blew out all dust, leaves, and shreds of branches, but the seeds of undersize, underweight, and imperfect maturity were also separated, thus producing a sample of seed of excellent appearance, and sound and high quality. The seed from each grade of mother beets of each variety was collected, cleaned, weighed, and preserved separately. The extra quality grade will be used exclusively upon the experiment station in further high-class experimentation. No. 1 grade will also be used, in some portion, by the station for experimental purposes. No. 2 grade, which may be considered as seed of an ordinary commercial quality, will be distributed or sold for the production of beets for factory use.

The actual results obtained with the six varieties used in the production of seed are shown in the following table, in which the area of ground planted and the weight of seed collected are given:

Variety.	Area.	Weight.	Yield per acre.
	Rods.	*Pounds.*	*Pounds.*
Vilmorin's Improved	20	117	936
Dippe's Kleinwanzlebener	20	128	1,024
Desprez	24	92	613
Lemaire	10.3	66	1,056
Knauer	15.0	126	1,344
Kleinwanzlebener Elite	9	66	1,173
Total	98.3	595	1,025

The actual yield from 98.3 rods of collected, cleaned, and weighed seed was pounds	595
Yield per acre	968
Value of 595 pounds, at 20 cents per pound	$119.00
Value per acre	193.60

A record of the cost of production of the seed was not made. Such an estimate or record would be of an extremely complicated character; including the cost of the production of the mother beets in the previous year, the expenses of siloing, analyzing, and classifying the mother beets, in addition to the cost of cultivating and harvesting the seed. Nevertheless, such an estimation of the cost of seed production will be made in the immediate future.

These experiments, which represent the first endeavor to produce sugar-beet seed by the strict methods of selection and culture which are practiced in Europe, and which have brought the European varieties to their present standard of excellence and value, are a trustworthy, although an initial, indication of what it may be possible to accomplish in the soil and climatic conditions of the region in which the station is located. However, nothing more can be stated with assurance until the *home-grown* seed has produced at least one generation of progeny, and it is found that the beets grown from the seed are equal in size and content of sugar, and the seed produced from those beets equal in quality to the seed imported from Europe and the beets grown therefrom. So far, the indications are full of promise of success.

CULTURAL SEASON OF THE BEET CROP.

The cultural season of the beet crop of 1892 was begun in October of 1891. The plowing and subsoiling of the land intended for planting in beets were done in the third week of October, and comprised the autumnal preparation for the next year's crop.

With the exception of three acres which had produced beets in 1891, the whole of the remaining portion of the station field had been laid to fallow in the summer of that year. The ground was virgin prairie, which had not produced a crop, and it was essential, in the first place, that a mode of treatment of the soil should be adopted by which the excess of undecayed organic matter would be most rapidly changed and reduced to the measure not inimical to sugar-beet production.

Breaking up the ground to a depth of 9 inches, in May, 1891, and a method of fallowing which kept the soil in motion and exposed to the action of the air and sun during the course of the summer, was a means of causing the most rapid oxidation and decay of the vegetable matter, and of converting the superabundance of organic nitrogen into inorganic forms, capable of being utilized for plant nutrition. An analysis of the soil had shown that the nitrogen present in the soil at a depth of 12 inches was as great as the amount found in the upper 6 inches, and for that reason the fallowing was conducted to a depth of 9 inches, in order that the largest possible mass of soil should be exposed to the action of the air.

In October the land of nearly the whole of the station was in the condition produced by such a course of fallowing. The plats selected for bearing beets in the following season were again plowed and to a depth of 10 inches, and subsoiled to a depth of 6 inches, thus securing the stirring of the soil to a depth of 16 inches. The width of furrow taken by the plow was 10 inches, or a width no greater than could be moved by the share of the subsoiler. In such a way the land was laid up for the winter, and was not touched again until the season of preparation in the following spring.

The work of preparing the soil for the reception of the seed was commenced in the spring on April 24. The act of preparation of the seed bed was delayed later than was desirable by the wet condition and low temperature of the soil. It is, however, more advantageous and better practice to delay the operations if the condition of the ground is not satisfactory.

The labor in the spring preparation of the seed bed was reduced to a minimum by the work of heavy cultivation which had been done in the autumn, and the fine state of pulverization of the soil which had been wrought by the action of frost during the winter. The actual preparation for planting was made in the first place by moving the ground to a depth of 5 inches with a disk harrow; afterwards a two-horse harrow was put twice over, when the ground was rolled down and the seed put in. After drilling in the seed with a one-row horse drill, the ground was rolled a second time. The details in the work of preparation and light cultivation of the ground were in the most part identical with the same in 1891, the latter being described in full in the report of that season.

The varieties of beets grown upon the station in 1892 were the Vilmorin Improved, Dippe's Kleinwanzlebener, Desprez, Le Maire Père et Souer, Kleinwanzleben Elite, and the Original Kleinwanzlebener. The variety Ferd Knauer, which was one of the six varieties grown in 1891, was replaced in 1892 by the original Kleinwanzlebener, owing to the circumstance that seed of the former variety could not be procured in time for planting.

Before planting, the quality of the seed of the six varieties was tested by special germinations, which were conducted in the station laboratory, and the degree of vitality observed is given in the following table, which states the rate as well as the measure accomplished by each variety.

Vitality of seed.

[One hundred seeds of each variety were planted; date of planting, April 27.]

Varieties	Vilmorin's Improved.	Dippe's Kleinwanzlebener.	Desprez.	Lemaire.	Kleinwanzlebener Elite.	Original Kleinwanzlebener.
Visible on—	*Plantlets.*	*Plantlets.*	*Plantlets.*	*Plantlets.*	*Plantlets.*	*Plantlets.*
May 1	8	0	0	3	1	0
2	20	2	0	7	7	0
3	54	31	0	30	55	22
4	78	50	8	56	80	62
5	89	59	20	66	85	84
6	93	66	26	81	85	89
7	94	70	29	85	85	89
8	96	70	33	85	85	89
9	96	70	36	85	85	89

The notable features in the germination are the high vitality of the Vilmorin variety and the extremely low germinating power of the Desprez.

April 30 the first seed was planted. One acre was drilled with seed of the Vilmorin Improved variety. The ground was in the finest condition of tilth, the seed bed being a mass of fine moist mold, and the temperature of the soil was 54° F.

Heavy rains immediately followed the first planting, and all further planting was delayed until May 20. The rains were accompanied with extremely low temperature, which caused a lowering of the temperature of the soil of 12° from the date of planting the first seed on April 30. The coldness of the ground delayed the germination of the seed, and the plantlets of the seeds sown on the last day of April were not visible along the rows until May 18, which was nearly twice the length of time occupied by normal germination. From May 20 the temperature of the air rose rapidly, and an equally rapid response was seen in the state of warmth of the soil.

The action of temperature upon germination was well illustrated during the period of planting, and some observations of interest are given in the following table:

Variety.	Date of planting.	Mean temperature of soil.		Date of appearance of plants.
		Days.	°	
Vilmorin's Improved	Apr. 30	18	46	May 18
Dippe's Kleinwanzlebener	May 20	10	56	May 29
Desprez	25	9	60	June 3
Lemaire	26	7	60	June 2
Kleinwanzlebener Elite	26	6	61.5	June 1
Original Kleinwanzlebener	31	5	64	June 4

Flat-hoeing was begun May 27, upon the plat planted on April 30. The ground was extremely soddened and caked by the heavy rains that had fallen during May and the hot sun at the latter part of the month. By hoeing, the plants were re-

leased from the encrusted condition of the surface, and they made a rapid growth, so that on June 8 they were large enough for thinning out.

The later-planted plats made a rapid growth; and, with the exception of the plat planted with the Desprez variety, all were a full and regular stand. In such respect, the season of 1892 was much more advantageous than the season of 1891. In 1891 the period of germination was extremely dry, and the plants came up at two different times. The planting season of 1892 was very moist, and all the seed germinated simultaneously.

The work of thinning out commenced June 8. Several of the workmen who had been employed upon the station in 1891 applied for further service, and they were reëmployed. Those men were already fairly well acquainted with the nature of the operation, and not only was the difficulty of training green hands very much lessened, but the amount of labor accomplished daily by each man was very greatly increased and the cost of the operation proportionally reduced.

The saving in time and expense which was effected by the greater skill of the workmen in the operation of thinning out the beets was the least important indication of increased expertness. The work was done in a precise, clean, and effective manner, and with a minimum of damage to the standing plants. Special experiments conducted last year showed that an unskillful handling of the plantlets in the process of thinning out may produce results of a disastrous character. It was seen that when the plants which are left standing are unduly disturbed in their connection with the soil, by the act of removing the surplus plants, not only the growth but the form and sugar content are later most materially affected. Those experiments were repeated in the season of 1892, and with results of a still more emphatic character. Plantlets which had been roughly handled were afterwards taken out of the ground and examined under the microscope. It was observed in each of thirty examples that the end of the taproot of the plantlet was ruptured and the rootcap was displaced. Further, a given number of such plantlets were replanted in a row parallel with another row of plants which had been thinned out with particular care, and the two rows were allowed to grow, under conditions in every other respect analogous, until the period of maturity, when the plants of each row were taken up, examined, weighed, and the sugar contents determined. In the first place, the beets from the row which was manipulated with great care at the time of thinning out, were perfect in form, without exception. The beets, however, from the transplanted, and more or less injured, plantlets exhibited an extreme degree of deformity. Amongst ten of those beets eight had failed to develop a taproot, and in place thereof three to five coarse prongs or fingers had grown out. The beets were utterly deformed, and without any points of resemblance to the other beets grown by the side of them. The weights and sugar contents of the respective beets were as follows:

	Number of beets.	Weight of beets (mean of 10 beets).	Sugar content.	Purity of juice.
		Grams.	*Per cent.*	*Per cent.*
Deformed beets	10	358	11.6	74.4
Correctly formed beets	10	324	15.0	79.7

It is seen that while the well-formed beets were of an excellent quality, the deformed beets were below the standard (in sugar content and purity of the juice) required for manufacturing purposes. And the results of those experiments urge a still more emphatic insistence upon care and a correct mode of manipulation being practiced in the operation of thinning out the beets. If the success of a crop can not be wholly assured by care and expertness in the work of thinning out, its prospect and value will be decidedly ruined by ignorance and neglect at that particular period in the history of the plant.

Thinning out of all the plats was completed on June 18. The work was accomplished, in all respects, in an almost perfectly satisfactory way. The distance between the rows, upon all the plats, was uniformly 18 inches. The distance between the plants in the row was, in the early-planted plats, 8 inches, and in the late-planted plats, 9 inches. The plants appeared to be of one uniform size, and the distribution over the ground showed the utmost attainable regularity.

About five days after the operation of thinning out the horse hoe was passed over all the plats. The ground, however, was particularly free from weeds, which was, in part, owing to the fallowing of the previous summer, and likewise to the circumstance that the ground was thoroughly moved by the hand and horse hoes as soon as the plantlets were visible in the rows. One day's labor, employed before the weeds have gotten a stronghold of the ground, will save the labor of several days later in the season. After the first time horse-hoeing, the hand hoe followed amongst the plants, every stray weed being cut out, the ground thoroughly removed, and the "double plants" drawn out which had been overlooked in the operation of thinning out. The hand-hoeing was again followed by the horse hoe, the operation being twice repeated at intervals of one week. The ground at the end of those operations was not only free from weeds, the surface, to a depth of 3 inches, was in a state of great fineness, looseness, and porosity, which condition favored a ready circulation of air in the upper layer, and prevented the rapid escape of moisture from the lower soil.

The operation required to complete the work of cultivation was the "soiling up." The foliage of the beets, as well as the root development, were too far advanced to allow of further work being done either with the horse or hand hoes, excepting the act of drawing up the loose soil from between the rows around the plants in the rows. That operation was performed between July 7 and 13. Upon the latter date the cultural period of the season closed (with the exception of some detail work conducted on certain very small plants, which will be spoken of later and in relation with the results obtained).

AN INSECT VISITATION.

The high condition of promise which the plats of all varieties exhibited in the middle of July, when the cultural work closed, was not maintained very long. On July 20 it was observed that a caterpillar had appeared upon the foliage of the beets, and in very threatening numbers. Although the visitation of those insects was extremely localized, and the sphere of their operations confined to patches of small area, yet the total damage was very great. Efforts were made to destroy the caterpillars before they could get into the ground to prepare for the production of a second generation. Preparations of Paris green were applied with sprinkling cans, the whole of the attacked portions of the plats being treated. Also Persian insect powder and white hellebore were tried, but the difficulty of applying insecticides in the form of a dry powder, and particularly in the presence of the winds which are usually blowing in Nebraska, rendered the application of substances in solution or suspension a more convenient and likewise a more effective operation. Paris green in suspension (one teaspoonful to one gallon of water) was applied to all the plats which were attacked, and evidently with a very considerable effect. Twenty-four hours after the application of the insecticide great numbers of the caterpillars were lying dead upon the ground. Unfortunately, however, the application of the Paris green was not made until a great number of the insects had left the leaves and gone into the ground, there to go through the stages of metamorphosis previous to their reappearance in the winged form as moths.

In the meantime communications were being conducted with the Division of Entomology at the U. S. Department of Agriculture, Washington, D. C., concerning the character of the visitation, the natural history of the species, and the mode of lessening the ravages or destroying the insect. On August 5 a communica-

tion was received from Mr. L. O. Howard, acting Entomologist, in which he said: "The matter is a very interesting one, and the insect is new to us. It seems to be a near relative to the so-called garden webworm (*Eurycreon rantilis*) which did great damage to cotton, corn, and many garden vegetables in Kansas, Colorado, Nebraska, Indian Territory, and northern Texas in 1885. It is a different species, however, and I find no account of it in the literature of economic entomology. It is quite likely that another generation will appear this summer unless your remedial measures have been extremely effective. The record of your experiments is very interesting, and there is no question but that the Paris green treatment is the best, everything considered. It would be desirable for you to determine the amount of Paris green which can be applied in solution without burning the foliage of the sugar beet, as this point has not heretofore been definitely ascertained."

Certain experimental data had already been obtained upon the question of the strength of solution of Paris green required to effectually destroy the insects in great numbers; and certain general, but no specific, observations had been made in order to determine the strength of solution that could be applied without damage to the beets. It was found that a solution containing one teaspoonful of Paris green to 1 gallon of water was effective in destroying all insects that were upon the upper surface of the leaves, and which ate of the sprinkled material. Many of the caterpillars, however, were upon the underside of the leaves, where they were protected from the insecticide applied, and, moreover, continued to feed upon the epidermis of the under leaf with complete immunity from its action. For the reasons indicated in the above remarks the application of insecticides can be only partially effective.

There is further the consideration of damage done to the crop by the application of insect-destroying substances. Where a solution of Paris green of the strength already given was applied and an overdose fell upon certain leaves those leaves were burnt through into holes, or turned brown in the places where the arsenical mixture lodged. However, a solution of the strength stated did not do an appreciable amount of damage, either to the foliage or the roots.

The intimation made by Mr. Howard, that a second generation of the insect might be expected to appear during the summer, caused a most careful daily attention to be given to the matter. The caterpillars of the first generation had wholly left the beets on August 1. On August 8 a number of gray-colored moths was observed. By the following day the number of those moths appeared to have increased a thousand-fold. If the foliage of the beets was disturbed they rose in cloud-form, and they were generally distributed over the greater portion of the plats.

About 100 of those moths were caught, inclosed in a box, and sent to the Department at Washington. In speaking of them, Mr. Howard said:

"In my last letter I hazarded the guess that the insect would prove to belong to the genus Eurycreon, and that it would be closely allied to the common garden web worm of Kansas, Nebraska, and other Western States—Eurycreon rantalis. The moth you sent is *Eurycreon stictalis*. Please watch the eggs which it is depositing upon the beet leaves, and send us larvæ which may hatch from them."

The leaves of some beets were examined under the microscope and the eggs of the moths observed. The eggs were deposited in minute groups, and exclusively upon the underside of the leaves. On August 20 the eggs were noticed to be hatching out, and numerous caterpillars of a very minute size were already upon the leaves. On the following day it appeared as though the whole crop were infested and doomed to utter destruction. Upon some plants 150 insects were deposited and were consuming the foliage at an extreme rate. No time was lost in the effort to destroy the second generation before it got a complete hold of the crop. Arsenicals were applied by sprinkling, the solution containing one teaspoonful of Paris green to a gallon of water. All the plats were treated with the insecticide, and at the rate of three pounds per acre. When the Paris green solution had been upon the crop only about eight hours a heavy rain began falling, which washed every trace of the

material from the leaves down into the neck of the beets or into the ground, and the application was without effect. The crop had already been treated twice with the arsenical, and where it had become deposited in considerable quantities in the necks of the beets the indications were that a further application could not be made without direct damage to the crop, and rendering it possibly unfit for manufacturing purposes. Consequently, no further attempt at destroying the insects was made with Paris green. Powdered quicklime and also soot were scattered over the patches which were the worst affected, but without any perceptible effect. It was likewise attempted to cross the rows with a light roller, and thus crush the caterpillars, but the latter appeared able to bear the operation with less destruction than the beets. Nothing could be done to stop the ravage of the insects. Had the rain not fallen so soon after the treatment with Paris green the application would very probably have been in a great measure effectual. As it was, no good was done, and nothing was considered of any possible value in the situation.

The caterpillars followed their natural course, and until the greater portion of the foliage of the crop was eaten down to the ground, only the northern ends of certain plats, bearing four different varieties, escaping the attack. But the ends of those plats were fortunately not in the least attacked by the second generation of the insect, although they suffered somewhat lightly from the ravage of the first generation, and they afford the data required to form a comparative estimate of the damage wrought by the visitation. Those data are shown in the following table, which is the record of the weights of the varieties upon a given date, and likewise of the weights of the portions of the plats which suffered from and those which escaped the attack.

Variety.	Date.	Yield per acre of insect-damaged beets.	Yield per acre of undamaged beets.
		Tons.	*Tons.*
Desprez	Oct. 15	10.9	16.8
Lemaire	15	10.9	15.8
Kleinwanzlebener Elite	15	9.8	16.0
Original Kleinwanzlebener	15	10.4	18.6
Mean		10.5	16.8

The difference shown in the two columns of the table indicates the actual loss in weight per acre of the beets of those varieties, caused by the insect visitation upon the station crop.

The visitation was observed in portions of the beet districts of the Grand Island and Norfolk beet-sugar factories. I was instructed to visit and inspect the beet fields of those districts, and to report upon the condition of the crop and the extent and ravages of the insect attack. Frequent inspections of the attacked fields in the districts specified were made, obtaining further data upon the nature of the visitation, and making such suggestions to the growers as had any appearance of value. The work of inspection was extremely facilitated through the active aid and courtesy extended by the Oxnard Beet-Sugar Company and the enterprising gentlemen in its service.

The climatic conditions prevailing at the time of the first visitation, and extending through the whole period, embracing likewise the appearance and duration of the second generation, were of an extreme character. An abnormally high temperature marked all that part of the season of which we have spoken, and the rainfall for June and July was unusually small. These data require to be considered in connection with the appearance of the insects and with the question of a probable recurrence of the visitation in the coming season. (By direction of Secretary Rusk, that portion of the Entomologist's annual report referring to this insect pest is appended to the present report.)

The climatic conditions prevailing during the cultural season of 1892 are given in comparison with the data for 1891, and with the normals for the district of the experiment station:

Rainfall.

Year.	May.	June.	July.	Aug.	Sept.	Oct.	Totals.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
1892	6.62	0.50	2.50	3.36	0.28	1.00	14.26
1891	1.38	11.59	6.71	2.22	0.84	3.92	26.61

The mean rainfall of the northern and southern districts of Nebraska for the same months: May, 3.50 inches; June, 3.68 inches; July, 3.09 inches; August, 2.96 inches; September, 1.57 inches; October, 1.50 inches; total, 16.30 inches.

Temperature.

Year.	May.	June.	July.	Aug.	Sept.	Oct.
1892	55.3	66.6	75.00	72.85	66.56	56.3
1891	59.0	68.4	69.90	70.20	65.10	47.6

Total units of heat for the given six months in—

1892	12,036
1891	11,651
Normal for same period	11,548

The climatic conditions of the cultural season of 1892 were characterized by a temperature considerably above the normal, and a rainfall not only little more than one-half of the rainfall of the cultural season of 1891, but very considerably below the normal precipitation. It is further observed that during the months of June and July, when the chief precipitation of the year takes place, the rainfall was phenomenally small. The rains of June and July are a chief factor in the development of a normal vegetation, and when that factor is irregular the measure of vegetable growth will vary in a similar way.

ANALYTICAL WORK OF THE SEASON.

The work of analyzing the beets was begun on September 1, with the assistance of C. B. Edson, of the station laboratory. On September 5, T. C. Trescot took charge of the polariscope and conducted the analytical work until the close of the season.

The condition of the crop on September 1 was in no measure what it should have been at that period in the season. In the place of the old foliage, which had been almost wholly consumed by the caterpillars, an absolutely new growth was in the stage of half development, so that the plats more nearly resembled their appearance on the last day of June than what they should have been on the date spoken of. The destruction of the old foliage not only caused a check in the growth of the roots; the sugar content of the beets was kept abnormally low, and by the production of the new set of leaves the sugar content was reduced to a still lower point. It was in the midst of the conditions of that period that the work of analysis was begun.

The mode of determining the results and value of the plats of each variety was by ascertaining the weight of beets per acre, and the content of sugar in the beet, and calculating from these factors the yield of sugar per acre.

The determination of the weight of beets per acre was conducted strictly according to the method adopted last year, and which is given in full detail in the report

of 1891, contained in Bulletin 33, Division of Chemistry, U. S. Department of Agriculture. In the season of 1892, however, the weight of the crop was taken twice, on September 15 and October 15, the latter date representing the period when the weight was at the maximum and growth had ceased. Each time when the weight was ascertained, the method consisted of taking up precisely 1 square rod of beets, which measure was determined by the use of a wooden frame 1 square rod in dimension. When the frame was laid down on the place selected, all the beets inside the square were gotten up, thoroughly cleaned, topped, and weighed, and the weight of the square rod taken as the unit of the acre.

The weights per acre of the six varieties grown are given in the following table:

Variety.	September 15.	October 15.
	Tons (per acre).	*Tons (per acre).*
Vilmorin's Improved	10.3	12.5
Dippe's Kleinwanzlebener	12.3	13.3
Desprez	16.5	16.8
Lemaire	15.1	15.8
Kleinwanzlebener Elite	15.7	16.0
Original Kleinwanzlebener	15.6	18.6
Mean	14.25	15.8

The weights given in the column under date of October 15 indicate the maximum weight per acre of each variety, and in that portion of the plats which suffered the least from the insect ravage. The attack of the caterpillars upon the ground planted with the Vilmorin's Improved and Dippe's Kleinwanzlebener varieties extended over the whole of those plats, and such is the precise explanation of the lower yield in comparison with the other four varieties. It is seen that an increase of weight was made between the middle of September and October 15, which observation is confirmed by the increased weight of the individual beets which gradually took place during that period.

As it has already been said, the work of testing the beets in the laboratory was begun on September 1. The mode of conducting the examination of the varieties was somewhat different from the procedure in the analytical season of 1891. There were six varieties grown. Commencing with the Vilmorin's Improved on September 1, the other varieties followed in the order in which they are recorded in the table of the weight determination. By giving one day to the examination of a variety the whole week was required for the testing of the six varieties. In such order, each variety was examined upon the same day every week, the work being continued without intermission from the first week of September until the second week in November. By such a mode of examination, and chemical control of the crop, the relative conditions of the varieties at the time of beginning the analytical work, the behavior of each variety under the fluctuating climatic conditions, and the rise of each toward its maximum value, with the gradual decline from the maximum, as the season approached the close, were clearly established.

In preparing the samples for analysis the method adopted last year was strictly followed. In order to obtain a reading or test of a variety never less than 100 beets were taken, and the usual number was 200 beets. Those beets were taken in "twenties" from five different parts of the selected row in the plat. Each "twenty" was taken consecutively, large and small, as the beets were standing, and in no case was a sample taken by selecting individual beets from different places in the row or selected parts of the plat. When taken up the beets were immediately taken to the laboratory and washed, dried, and weighed without any delay. The 200 beets were not all taken up in the morning, but only one-half of that number, and the second hundred was gotten up after the first part was analyzed and recorded. The ob-

ject of those precautions was to allow no time for loss of weight in the beets before the juice was expressed, and thus avoid obtaining too high polariscope readings. All beets and samples of beets were analyzed in their normal condition, or in the exact state in which they left the soil, consequently the analyses of the station laboratory are correct readings of the actual sugar contained in the crop upon given dates. The errors proceeding from analyses which are made with beets that are more or less dried out will be considered in a later part of the report.

The beets, which had already been washed, dried, and weighed, were at once ground up, and the juice expressed from the pulp. The first hundred beets each day were analyzed individually, and the juice from each one was expressed with a small hand-press and the use of small filtering bags. The beets of the second hundred were always ground up in "tens," and the juice from each "ten" obtained in one sample, the expression of the juice being accomplished by the use of a high-power screw-press.

The question concerning the relative richness in sugar of the first and second portions of the juice expressed from a sample of beets is not yet generally decided. An experiment was made by the station laboratory, 100 beets being used for the purpose, and the pulp of 10 beets going to one analysis. The relative sugar content of the first and second expressions are given in the following table. The first half of the juice was obtained by expressing with the hand, and the second half by the heavy screw press, each portion being, as it is designated, an exact half of the total juice capable of being expressed.

Number of beets.	First half of juice.			Second half of juice.		
	Brix.	Sucrose.	Purity.	Brix.	Sucrose.	Purity.
	Degrees.	*Per cent.*	*Per cent.*	*Degrees.*	*Per cent.*	*Per cent.*
10	18.8	14.6	77.6	18.7	14.8	79.1
10	19.4	15.6	80.4	18.9	15.5	82.0
10	17.3	14.0	80.9	17.4	14.1	81.0
10	18.1	13.7	75.7	17.2	13.8	80.2
10	16.8	13.4	79.8	16.7	13.0	77.8
10	19.0	14.9	78.4	19.0	15.0	78.9
10	18.4	14.6	79.3	18.4	14.9	81.0
10	18.9	14.4	76.2	18.7	14.8	79.1
10	18.5	14.1	76.2	18.7	14.7	78.6
10	19.9	15.8	79.4	19.4	15.5	79.9
Means	18.5	14.5	78.4	18.3	14.6	79.8

The table shows that the juice of the second expression was not only slightly richer in sucrose but notably higher in purity than the juice of the first half.

It has been stated that of the 200 beets analyzed each day, 100 were tested individually, and the second 100 by grinding 10 beets together, expressing the juice from the whole pulp, and taking one sugar reading of the whole. The object of handling a given number singly was to observe the degree of variation in the weight and sugar content of the individual beets. But the reasons for analyzing in bulk, as it may be termed, where a number of beets are analyzed collectively, are several and important. It is known that small beets are usually richer in sugar than large ones. When 100 beets are analyzed individually the sugar content of each is recorded. In obtaining the mean sugar content of the 100 beets, the small beets not only count for as much as the larger ones, they bear somewhat more towards the result because of the greater richness in sugar. The proportion, by weight, of the small beets to the aggregate weight of the crop, however, is in the opposite direction. A crop composed at the rate of 100 beets weighing 200 grams and 100 beets weighing 400 grams indicates that the larger beets compose two parts in three of the whole crop, and the smaller beets only one part in three of the same. It will thus be observed that if the yield of sugar per acre be calculated from the weight of beets per acre and the mean sugar content of the individual beets, the result

will be too high. That error is corrected by analyzing in bulk, or taking the mean sugar reading of ten or twenty beets which have all been ground up together. If the smaller beets are richer in sugar they yield a less quantity of pulp and juice, and only influence the actual sugar reading in the exact relative proportion. Consequently, the sugar readings of beets which have been analyzed in bulk furnish the actual sugar content of the crop; and when the mean of those readings is taken in calculation with the weight of beets per acre the exact yield of sugar per acre is given. The only exception to the statement that "the smaller beets are richer in sugar than the larger" occurs in the early part of the season, and before the crop has reached maturity. The larger beets mature somewhat earlier than the smaller ones, and in the first period of the ripening season it is found that the larger beets give a higher sugar reading in the mean than the small beets; but that difference is quite reversed in the end.

Having explained the mode of obtaining the samples of beets in the field, the preparation of the beets for grinding, and the method of securing a juice whose sugar content is, as nearly as possible, a true reading of the richness in sugar of the crop, the analytical data relating to each variety will be given, extending from September 1 to the close of the analytical season. The development, history, and results of each variety will be recorded in a separate table, in which the mean weight of the beets, the mean sugar content, and the mean purity of the juice will be given for each week from the opening to the close of the work. The means found in the tables, and which are accepted as showing the actual condition of the variety upon the given dates, are based upon the data obtained from the analysis of 200 beets.

Vilmorin's Improved Variety.

Date.	Number of beets.	Weight of beet.	Brix.	Sucrose.	Purity.
		Grams.	*Degrees.*	*Per cent.*	*Per cent.*
Sept. 1	Mean of 50 beets	216	15.3	12.4	80.2
8	Mean of 200 beets	222	15.0	12.2	81.0
15	Mean of 200 beets	225	14.1	11.7	77.5
22	Mean of 200 beets	252	15.3	11.6	74.5
29	Mean of 200 beets	241	16.9	13.5	80.8
Oct. 6	Mean of 200 beets	230	17.8	15.1	83.0
13	Mean of 200 beets	222	18.2	15.2	83.2
20	Mean of 200 beets	242	17.8	14.6	80.2
27	Mean of 200 beets	240	17.7	14.8	80.5
Nov. 5	Mean of 100 beets	256	16.0	13.0	81.2
18	Mean of 100 beets	243	16.7	13.2	80.4

The behavior of the Vilmorin's Improved variety was peculiar. The peculiarities, however, are more apparent than real, and are wholly traceable to the action of the insect attack. It is seen that on September 1 the sugar content in the juice was 12.4 per cent. From that date until September 22 the sugar in the juice went down. With the apparent loss of sugar a very noticeable increase took place in the weight of the beet, which rose from 216 grams to 252 grams.

From the time that the caterpillars disappeared from the plat, which was about the first three days of September, the beets developed a new crop of foliage, and very rapidly. With the appearance of the fresh foliage a new period of assimilation and growth began, which gradually added weight to the beets. The new growth and the increment of weight of the beet appeared to have been made, in some measure, at the expense of the suger contained in the beet. That result, however, was only in appearance. As a matter of fact an increase had occurred in the actual quantity of sugar present in the organism, although the sugar content of the juice had decreased. That result may be determined by a comparison of the weights and sugar contents of the beets on September 1 and 22, respectively. On September 1 the mean weight of the beets of the plat was 216 grams. The sugar content of the juice upon that date was 12.4 per cent, which shows that the beet at that time con-

tained 26.78 grams of sugar. On September 22 the mean weight of the beets of the same plat or crop was 252 grams. The sugar content of the juice was 11.6 per cent, or 29.0 grams of sugar, which is a gain of 2.2 grams of sugar during the interval of time considered. The increase of the total weight of the beet, however, had been out of all proportion greater than the increase in the weight of the sugar in the beet, and that circumstance reduced the proportion of the sugar relative to the other constituents of the organism. The chief increase had been made in the water present in the beet, and that caused the sugar and other soluble solids to be contained in a more dilute solution in the juice. The table shows that the Brix reading of the juices on September 1 was 15.3; but on September 15 only 14.1, indicating that a large amount of water had been taken up by the beet.

From September 22 to October 13 the table shows a rapid and notable increase in the sugar richness of the beet, but at the same time a slight falling off in the weight of the beet during the same interval. The increase of sugar was in part actual, and also in part only apparent, and was owing to a concentration having taken place in the juice of the beet by the loss of water. During that period the temperature of the air and soil was extremely high, and the loss of water from the beet by evaporation was greater than could be made up by capillarity. Some of the beets were quite soft from loss of moisture. If the observations are carried on until October 20 a decrease in the sugar content of the juice but a rise in the weight of the beet are observed; and these coincident circumstances are explained by a notable lowering of the temperature of the air and a fall of one-third of an inch of rain. On October 27 the sugar in the juice had risen two-tenths of 1 per cent, but the weight of the beet had slightly fallen. On November 5 a very notable fall had occurred in the sugar content of the juice—from 14.8 to 13 per cent—but a corresponding rise had taken place in the weight of the beet. Now, during the preceding week, 1 inch of rain had fallen, and the temperature had come down to a daily mean of 40 degrees.

If the relative weight of the beet and the corresponding sugar contents are viewed during the period from September 1 to November 5, the behavior of the organism in relation to its sugar content is observed as follows:

Weight and sugar contents.

Date.	Weight of beet.	Sugar in the juice.	Sugar in the beet.
	Grams.	*Per cent.*	*Grams.*
Sept. 1	216	12.4	26.78
22	252	11.6	29.00
Oct. 13	222	15.2	32.60
Nov. 5	256	13.0	33.28

The data contained in the table show that there was a gradual increase in the weight of sugar contained in the beet from September 1 to November 5, and that on the latter date the actual weight of sugar to the acre was greater than at any previous time. The data further indicate that the sugar content of the beet is a more constant factor and less liable to fluctuations under the influence of climatic changes than has been duly considered. The indication emphatically suggested by the observations recorded is that the sugar content of the organism is practically an invariable factor, and that the constituent of the beet which is the factor chiefly subject to fluctuation is the water content, the variability of which is caused and controlled by the temperature of the air and soil, and the rainfall.

A more exhaustive analysis has been made of the data belonging to the "Vilmorin's Improved" variety than will be attempted with the tables of data of the varieties yet to be recorded, for the particular reason that the Vilmorin's Improved plat was selected and controlled with the special purpose of establishing the cost of pro-

duction of the crop. Consequently each detail was observed with a care and accuracy which could not be extended to all the plats in the field. For example, in determining the mean weight of the beet each week, when the variety was analyzed, the removal of the top and neck was always in the same exact proportion. The topping and necking of the other varieties was not always done by the same individual, nor the same proportion of neck always removed. And again, in the case of the Desprez variety, it was found in the first analysis that too small a portion of the beet had been cut off as "neck" before taking the weight, on account of the coarseness of that variety; and in the following week more of the neck was removed, which lowered the mean weight recorded. Nevertheless it will be found that each of the varieties exhibit the nature, mode, and degree of fluctuation from week to week, which were observed in the example of the Vilmorin's Improved variety.

Dippe's Kleinwanzlebener Variety.

Date.	No. of beets.	Weight of beet.	Brix.	Sucrose.	Purity.
	Beets.	*Grams.*	*Degree.*	*Per cent.*	*Per cent.*
Sept. 2	Mean of 50	236	15.0	12.0	79.3
9	200	301	14.8	11.7	76.0
16	200	271	15.8	12.5	78.8
23	200	271	17.0	13.8	80.9
30	200	292	18.7	14.8	77.8
Oct. 7	200	291	19.5	16.0	80.1
14	200	279	19.9	16.0	79.5
21	200	291	19.0	15.0	79.8
28	200	306	19.1	15.3	79.4
Nov. 5	100	322	18.3	14.4	78.7
18	100	329	17.5	13.9	78.1

Desprez Variety.

Sept. 3	Mean of 50	422	12.5	8.8	70.7
10	200	404	13.6	9.6	73.8
17	200	418	14.7	10.7	71.3
24	200	420	15.2	11.4	71.8
Oct. 1	200	448	15.5	12.2	74.0
8	200	401	17.2	13.0	75.0
15	200	384	17.4	13.0	73.1
22	200	385	16.9	12.5	71.8
29	200	390	16.0	11.8	71.1
Nov. 5	100	390	16.3	12.3	72.6
18	50	377	16.2	12.0	73.9

Lemaire Variety.

Sept. 5	Mean of 50	285	12.9	9.1	73.3
12	200	274	14.0	10.8	75.6
19	200	286	15.7	11.8	75.8
26	200	282	17.4	12.9	75.2
Oct. 3	200	275	17.6	13.8	75.4
10	200	288	17.9	14.2	76.4
17	200	260	19.1	14.6	76.9
24	200	270	18.7	14.0	75.1
31	200	256	18.3	13.5	72.5
Nov. 5	200	265	17.6	13.1	74.9
18	100	272	16.9	13.1	77.4

Kleinwanzlebener Elite Variety.

Sept. 6	Mean of 50	269	13.6	10.2	74.9
13	200	267	14.7	11.7	78.0
20	200	280	16.1	12.2	75.6
27	200	291	17.2	13.5	77.6
Oct. 4	200	288	18.0	14.0	77.0
11	200	265	18.8	15.2	81.1
18	200	266	17.5	14.3	78.0
25	200	275	17.4	13.2	74.7
Nov. 1	200	261	17.6	14.0	79.9
5	100	248	17.7	14.2	80.1
18	100	252	17.3	14.0	80.4

Original Kleinwanzlebener Variety.

Date.	No. of beets.	Weight of beet.	Brix.	Sucrose.	Purity.
	Beets.	*Grams.*	*Degree.*	*Per cent.*	*Per cent.*
Sept. 7	Mean of 50	309	14.3	11.0	77.4
14	200	311	15.7	12.7	78.6
21	200	306	18.2	14.3	79.2
28	200	326	18.6	14.7	77.8
Oct. 5	200	316	19.8	15.7	77.7
12	200	320	19.5	16.1	80.2
19	200	314	20.8	15.9	76.3
26	200	301	20.0	16.1	78.9
Nov. 2	100	320	19.4	14.5	75.3
5	100	333	19.2	14.7	76.3
18	100	320	18.2	14.4	79.2

It will be remembered that in the tests made to determine the vitality of the seed of the varieties planted, the Desprez variety showed a germinating power of only 36 per cent. That circumstances affected the history of the variety during the whole season. The crop was not more than two parts in three of a full stand. The development of the organism was irregular, and the beets when mature were extremely coarse, and the sugar content and purity of the juice remained abnormally low. In the season of 1891 the Desprez variety gave the largest weight per acre, with the highest sugar content and purity of juice amongst the six varieties grown. It must thus be considered that the poor results obtained in 1892 with that variety are in a great measure owing to the small degree of vitality of the sample of seed, which sample was the only one of that variety available at the time of planting.

The higher yield per acre of the "Original" Kleinwanzlebener was, in part, owing to the circumstance that the variety was totally exempted from either of the successive insect attacks on one portion of the plat.

The following table gives the weight per acre of beets, the highest sugar content in the juice, with the yield of sugar per acre of each variety:

Variety.	Weight per acre.	Sucrose in juice.	Sugar per acre.	Purity.
	Tons.	*Per cent.*	*Pounds.*	*Per cent.*
Vilmorin's Improved	12.5	15.6	3,900	83.2
Dippe's Kleinwanzlebener	15.0	16.0	4,800	80.9
Desprez	16.8	13.0	4,368	75.0
Lemaire	15.8	14.6	4,614	77.4
Kleinwanzlebener Elite	16.0	15.2	5,120	81.0
Original Kleinwanzlebener	18.6	16.1	5,989	80.2
Means	15.8	15.1	4,890	79.6

A comparison of the seasons of 1891 and 1892 indicates as follows:

Season.	Mean weight of crop of all varieties per acre.	Mean sugar per acre of all varieties.
	Tons.	*Pounds.*
1891	21.7	6,060
1892	15.8	4,800
Mean	18.8	5,430

The mean results of the seasons of 1891 and 1892, obtained upon the Nebraska station, are given in comparison with the mean of results of the same seasons recorded at the Capelle station, France:

Stations.	Beets per acre.	Sugar per acre.
	Tons.	*Pounds.*
Capelle (France)	17.5	5,366
Schuyler (Nebraska)	18.8	5,430

The data from the French station represent the mean condition of the crop in all the experimental fields on November 18, 1891, and November 1, 1892, as stated in the weekly bulletin of that station.

The causes of the smaller yield per acre of the crop in 1892, in comparison with the crop of 1891, upon the Nebraska station, have been already fully considered in parts of the report treating of the climatic conditions and the insect attack.

A series of experiments was made upon small plats, exclusively managed by hard labor, in order to observe the results obtained with a varying number of plants to the acre, or of thick and thin planting.

The following table gives the data recorded:

Date.	Plat.	Number of beets to the acre.	Weight per acre.	Sucrose in juice.	Sugar per acre.
			Tons.	*Per cent.*	*Pounds.*
Oct. 11	A	65,300	13.2	16.6	5,043
11	B	56,000	12.2	17.6	4,296
11	C	49,000	14.3	16.0	4,599
11	D	43,500	11.8	15.9	3,753
11	E	39,200	10.5	16.0	3,344

The only notable characteristics of the plats of the given series are the small yield of beets and the extreme richness in sugar. It is, however, clearly shown that the thick planting gave the largest yield of sugar to the acre.

A plat of 4 square rods was planted, the rows being placed 36 inches apart. Upon one-half of the plat the plants were left 6 inches apart in the row, which gave 29,000 plants. Upon the other half the plants were left 12 inches apart in the row, giving 14,500 plants to the acre.

The results obtained were as follows:

Date.	Plat.	Number of beets per acre.	Weight per acre.	Sucrose in juice.	Sugar per acre.
			Tons.	*Per cent.*	*Pounds.*
Oct. 11	First half	29,000	10.5	15.0	3,150
11	Second half	14,500	11.5	12.9	2,967

It is observed that although the second half of the large beets yielded the greater weight per acre, the part of the plat bearing the smaller beets yielded the largest weight of sugar per acre. Moreover, the small beets not only contained 6 per cent more sugar to the acre than the larger beets, the amount of sugar that could be obtained by manufacture from the smaller beets was very much greater because of the greater purity of the juices in comparison with the juices from the large beets.

	Per cent.
Purity of juice of small beets	79.7
Purity of juice of large beets	75.6

During the analytical season of 1891, a series of experiments was made in order to ascertain the loss of weight by evaporation when the beets were exposed, at varying temperatures, to the action of the atmosphere different lengths of time.

In the season of 1892 not only were the experiments upon evaporation and loss of weight continued, those experiments were conducted in order to embrace a study of the problem, viz: The cause of decomposition and loss of sugar in the beet after removal from its normal connection with the soil.

Much attention has been given to the question of the loss of sugar by several distinguished French scientists, and the opinions of those gentlemen upon "the loss of weight and richness of the beet" may be noted as follows: M. Pellet says "All that

is known is that there is a certain loss, and especially an alteration of tissue in the beet." M. Blim says: "The loss is important. But for want of precise information we can not estimate the loss." M. Pagnoul says: "The loss can not spring alone from the sprouting." M. Martin says: "Ventilators in silos increase the respiration and loss of sugar by letting in the oxygen of the air." In opposition to M. Martin, MM. Battut, Beaudet, Desprez, Salo, and Pierrot state that "moving the beets in the silos and letting in the cool air is of utility." The statements that have been quoted are taken from a translation from the Bulletin de l'Association des Chemists de France et de Colonies.

The opinions cited do not touch the question of the primary cause of the loss of weight and sugar in the beet, but are rather statements concerning the chemical changes, which, by the action of a given cause or causes, are observed to take place in the organism of the beet. It is the cause of those chemical changes with which we are concerned, and a knowledge and control of the external conditions which disturb the normal condition of the beet. And under this head there is "no precise information" to enable "us to estimate the loss" of which we speak.

The series of experiments carried out at the station in the season of 1892 was for the purpose of studying the problem stated.

The loss of sugar was studied in association with the loss of weight of the beet, in certain known conditions of temperature of the air and soil. The normal weight of the beet, or its weight when removed from the soil, was the basis of all comparisons and calculations of changes observed to have occurred after its removal from the soil.

On October 3, a square rod of beets of the Vilmorin's Improved variety was gotten up, cleaned, topped, and weighed immediately, and all was completed in fifteen minutes. Before weighing, every particle of soil was removed and the tops were cut off close to the neck, but the neck was not removed. The square rod of beets was weighed at the time of getting up and laid about on the ground again, and reweighed every twenty-four hours for the following four days.

The results of the weighings were as follows:

Date.	Weighings.	Weight of 1 square rod.	Loss of weight for—
		Pounds.	*Per cent.*
Oct. 3	Original weighing	152	
4	Second weighing	132	1 day =13.2.
5	Third weighing	116	2 days=23.8.
6	Fourth weighing	103	3 days=32.4.
7	Fifth weighing	95	4 days=37.5.

From October 3 to 7 the daily mean temperature of the air was 68°, the mean maximum temperatures for the given days being 90°, which was abnormally high for that period. The rays of the sun were not intercepted by clouds during the four days. Moreover, a wind of high velocity prevailed on each day named. It was observed that under the action of the sun and winds, such as has been described, the beets lost by evaporation no less than 37.5 per cent of their weight.

The sugar content of the beets of the said plat containing the square rod at the time of the original weighing was (mean of 200 beets) 15.1 per cent; the sugar content of the beets upon the last day of weighing (mean of 200 beets) was 17.1 per cent.

It is seen that although the beets lost no less than 37.5 per cent of their weight during the stated period the polariscope reading of the juice of the withered beets was only 2 per cent higher than the reading of the juice of the fresh beets. A great loss of sugar had taken place. The second polariscope reading, instead of being

17.1 per cent, should have been 24.2 per cent had no loss of sugar taken place. The following table shows the proportion of loss:

		Sucrose in juice.	Sugar in beets.
		Per cent.	*Pounds.*
Oct. 3	1 square rod = 152 pounds	15.1	22.95
7	1 square rod = 95 pounds	17.1	16.24
	Difference	....	6.71

Loss of sugar in four days equals 29.24 per cent.

Even after allowing for the abnormally high temperature recorded during the period of the experiment, the loss of sugar that had taken place was so enormous as to lend doubt to the result notwithstanding the care that had been observed in all the details. The experiment was repeated, and in the following manner: One hundred and fifty beets were gotten up of the Vilmorin's Improved variety and divided into 3 fifties, each of the same weight, 25 pounds. One fifty was analyzed immediately after weighing. Another fifty was left lying on the field, and the third fifty was laid upon a board in the barn, and exposed to the air, but shaded from the sun.

The table following gives the results:

Date of analysis.	Weight of beets.	Loss of weight.	Sucrose in juice.
	Pounds.	*Per cent.*	*Per cent.*
Oct. 8 (fresh beets)	25	....	16.2
11 (shed beets)	20	20.0	19.6
11 (field beets)	19.5	22.0	18.3

The actual changes in the sugar content of the shed beets and the field beets are shown as follows:

Beets.	Weight of beets.	Sucrose in juice.	Sugar in beets.	Loss of sugar.
	Pounds.	*Per cent.*	*Pounds.*	*Per cent.*
Fresh beets	25.0	16.2	4.05	....
Shed beets	20.0	19.6	3.92	3.2
Field beets	19.5	18.3	3.56	12.1

It is seen that the "shed beets," during the seventy-two hours that they lay exposed to the air, but shaded from the sun, lost 20 per cent of their weight and 3.2 per cent of sugar. The "field beets" lost 22 per cent of their weight and 12.1 per cent of sugar. The mean temperature during the three days that the experiment lasted was 58.6°, or 10° less than prevailed in the first experiment, which difference of temperature accounted for the smaller loss of weight and sugar, as shown in the latter experiment. A striking feature in the last experiment is the circumstance that the shed beets lost almost the same proportion of their weight as the field beets, but their loss in sugar was only one-fourth of the loss in the field beets. It is thus indicated that the action of the sun was a chief cause of the greater loss of sugar in the field beets. The latter observation was illustrated by an earlier experiment, which was conducted as follows:

Exactly 210 beets, of the original variety, were gotten up and prepared for analysis. The mean weight of the 210 beets was 326 grams. Before analyzing, 10 beets were selected from the number, and the mean weight of the selected beets was 325 grams, or the mean of the whole. The 10 beets were each wrapped closely in thick

paper and all put in a mail box, which was tightly fastened up and sent to Washington for analysis in the laboratory of the Department of Agriculture. On arrival at the Department laboratory the beets were immediately reweighed and analyzed individually and the results sent to the station at Schuyler.

The following table gives the results:

Date.	Number of beets.	Weight of beets.	Loss of weight.	Laboratory.	Sucrose in juice.	Sugar in beets.
		Grams.	*Per cent.*		*Per cent.*	*Grams.*
Sept. 28	200	326	....	Schuyler	14.7	47.9
Oct. 2	10	289	12.0	Washington	16.6	47.9

The latter experiment was made merely as a practical test of the condition of the beets after shipment to Washington. The results, however, provide an opportune illustration and support of the circumstances indicated in the preceding experiment, viz, that the beet may lose weight by evaporation, under certain conditions, without a loss of sugar taking place, and that the action of sunlight is a potent factor in causing the decomposition of sugar.

The experiments which have been recorded furnish the most precise data, showing that the decomposition and loss of sugar in the organism of the beet, after its removal from the soil, are caused by heat, and particularly by the action of the sun, and that the rate of decomposition and loss is in proportion to the degree of temperature. The apparently greater loss in direct sunlight is probably no more than can be accounted for by the difference between the temperature in the shade and in the sun, which difference could amount to 30° when the temperature of the air is 90°.

Having observed the action of high temperature upon the organism of the beet and shown that the loss of sugar is in proportion to the degree of temperature, it appeared of particular moment and value to observe the influence of low temperature, and to obtain, if possible, data which might conduct to a mode of storage and preservation of the beets after their removal from the soil that would prevent the great decomposition and loss of sugar which has always been known to occur.

It was decided to store a given number of beets in the ground, the temperature of the soil and the air being recorded, and to place an equal number of beets, in all respects the same as the first lot, in a refrigerator, where the temperature could be maintained approximately at ice temperature. On October 12, when the beets were placed in the earth, the refrigerator had not been delivered, and the cold-storage test could not be run simultaneously with the earth test. It was not material, however, as the conditions of each mode of storage were regulated and recorded rigidly and have the same value. In the earth-storage test the results observed in the instance of six varieties will be given. The beets were gotten up, the tops removed within 1 inch of the neck of the beet, and placed in pits in the earth immediately. The laying in was done by placing a row of beets in a slanting position, with the root on the ground. Between each row a layer of fine soil was placed, and before covering up the beets the soil about them was made moist with water. The covering of soil was 1 foot deep, and the mean temperature of the soil at the time of storing was 63°.

The following table shows the results of storing in earth at the given temperature of the soil (63°) for a mean period of twenty-one days:

Varieties.	Fresh beets.		Stored beets.	
	Date.	Sucrose in juice.	Date.	Sucrose in juice.
		Per cent.		*Per cent.*
Vilmorin's Improved	Oct. 13	15.3	Nov. 3	11.4
Dippe's Kleinwanzlebener	14	16.0	3	13.5
Desprez	15	13.2	4	10.8
Lemaire	17	14.6	4	10.4
Kleinwanzlebener Elite	11	15.2	4	13.6
Original Kleinwanzlebener	12	16.1	4	13.1
Mean	....	15.1	....	12.1

The behavior of the beets in earth storage in the seasons of 1891 and 1892 is seen as follows:

Mean of all varieties.	Temperature of soil.	Date.	Sucrose in juice.	Date.	Sucrose in juice.
	°		*Per cent.*		*Per cent.*
Season 1891	51.5	Oct. 15	14.6	Nov. 6	12.6
Season 1892	63.0	15	15.1	4	12.1

It is seen that in the same length of time the beets in 1891, with a soil temperature of 51°, lost 2 per cent in sugar, whilst in 1892, with a soil temperature of 63° the loss was 3 per cent. It must also be considered that the beets had possibly lost a little in weight, in which case the sugar content should appear higher rather than lower. The loss above consequently, was probably somewhat greater than the table indicates.

Storing beets when the soil temperature is above 50° is an undesirable practice. In the uncertain climate of Nebraska it is imperative in order to be safe, as a warm spell may be suddenly followed by a very great fall of the thermometer. On October 20, 1892, the day temperature was 71°, and in the night of October 23 the thermometer went down to 15° (F.). Many beets were frozen too badly to keep.

The experiment conducted in order to establish the results and value of cold storage as a mode of preserving beets after removal from the soil was carried out as follows:

On October 27, 150 beets of the original variety were gotten up, the tops removed to within 1 inch of the neck, washed, and dried. Immediately on being dried the beets were divided into three "fifties" by selecting the largest beet and running down to the smallest and placing a beet by rotation to each of the three lots, thus obtaining a division of the whole into three parts practically identical in weight and quality. After the division each fifty was weighed and the weights recorded. One fifty was immediately analyzed and the sugar content and purity of the juice ascertained. A second fifty was placed in the earth at a depth of 1 foot. These beets were laid in and interlaid with soil, so that they did not touch each other, and before being covered up the soil and beets were made moist by sprinkling with ice water. The temperature of the soil on October 27, when the beets were put in the soil, was 43°, which was further lowered by the ice water. The third fifty was placed in an ice chest or refrigerator. Before being put in the beets were made moist and rolled in earth, in order that the surfaces should be placed as nearly as was possible in normal conditions. Very little earth, however, could be made to adhere to the beets, and the portion that did adhere did not do so in the manner that the soil particles are attached by the root fibers in the natural condition. The temperature of the refrigerator was 41° at the time the beets were put in, and 32° when

they were taken out. The chest was closed and not opened again, except at the top for putting in ice, until November 18, upon which date the beets were removed from the earth and the refrigerator and analyzed.

Before analyzing, the beets were washed, dried, and reweighed. The weights before and after storage were as follows:

Date.	Beets.	Weight of beets before storing.	Date.	Weight of beets after storing.	Loss of weight.
		Pounds.		*Pounds.*	*Per cent.*
Oct. 27	Fresh beets	30.5	Nov. 18		
27	Earth beets	30.0	18	30.5	
27	Refrigerator beets	30.0	18	28.5	6.0

The analyses of the beets of each fifty are recorded in the following table. The beets were analyzed in tens, five readings being made in the analysis of each lot:

Fresh beets analyzed Oct. 27.			Earth-stored beets analyzed Nov. 18.			Refrigerator beets analyzed Nov. 18.		
Brix.	Sucrose in juice.	Purity.	Brix.	Sucrose in juice.	Purity.	Brix.	Sucrose in juice.	Purity.
Degrees.	*Per cent.*	*Per cent.*	*Degrees.*	*Per cent.*	*Per cent.*	*Degrees.*	*Per cent.*	*Per cent.*
20.2	15.2	75.3	20.0	16.5	82.5	22.5	17.8	79.2
19.6	14.8	75.4	19.9	16.1	81.4	22.0	16.8	76.4
20.5	16.5	80.5	18.6	15.0	80.6	21.8	17.6	80.7
21.1	16.1	76.3	20.5	16.0	78.0	21.0	15.3	73.0
21.8	16.8	77.1	19.8	15.8	79.8	21.0	16.8	80.0
20.6	15.9	76.9	19.7	15.9	80.4	21.6	16.9	77.9

It is seen by the table that the earth-stored beets gave precisely the same sugar reading after twenty-two days as the fresh beets did. The refrigerator beets gave a reading of 1 per cent higher than the fresh beets. It was seen, however, that the refrigerator beets had lost 6 per cent in weight, which would cause the sugar content of the beets to appear 6 per cent greater, providing the actual sugar content had not altered. Now, if 6 per cent be deducted from the polariscope reading, 16.9 per cent, the result is 15.9 per cent, which shows that the sugar content had remained constant. The following table illustrates the actual results:

Date.	Beets.	Weight of beets.	Sucrose in juice.	Sugar in beets.
		Pounds.	*Per cent.*	*Pounds.*
Oct. 27	Fresh beets	30.5	15.9	4.8
Nov. 18	Earth-stored beets	30.5	15.9	4.8
18	Refrigerator beets	28.5	16.9	4.8

It is now possible to give a tabular comparison of the beets which were stored in the earth on October 15 and the beets placed in cold storage, for it must be understood that the temperature of the soil on October 27 was about the same as the temperature of the refrigerator. Also, ice water was added to the soil before it was laid over the beets in the ground, thus securing a still lower temperature, and a proper degree of moisture, which was not possible in the refrigerator. Further, the temperature of the soil after October 27 went gradually down to 35°, thus securing the same temperature as prevailed in the refrigerator with the favorable soil humidity.

It was shown that the earth-stored beets lost no weight, whilst the refrigerator beets lost 6 per cent.

Year.	Beets.	Temperature of the soil.	Date.	Sucrose in juice.	Date.	Sucrose in juice.	Loss of sugar.
		°		*Per cent.*		*Per cent.*	*Per cent.*
1891......	Mean of all varieties	51.5	Oct. 15	14.6	Nov. 6	12.6	13.7
1892......	......do......................	63.0	Oct. 15	15.1	Nov. 4	12.1	19.9
1892......	Cold storage..................	35.0	Oct. 27	15.9	Nov. 18	15.9	....

The experiments that have been recorded indicate that the primary cause of the decomposition and loss of sugar in the beet after its removal from the natural connection with the soil is heat. The depreciation in sugar has been shown to be in proportion to the degree of temperature. High temperature causes a rapid and great loss of sugar, whilst at a low and constant temperature the beet can be preserved without any loss in the sugar content.

Cold-storage silos for the preservation of beets for propagation uses are thus to be advised, and particularly as we have no data to refute the reasonable supposition that beets whose organism has undergone the change which is implied by the loss of 20 per cent of sugar—*i. e.*, of one of the constituents—are not in as good a condition to produce seed as though the normal state of the organism had been maintained. Cold storage is equally to be advised in connection with factories as a principle, but the large scale of the operations may prevent its application.

COST OF PRODUCTION.

The cost of production of an acre of beets upon the station field is shown in the following statement:

Cost of production of 1 acre of beets.

1891.				
Oct.	1.	Light plowing		$1.68
	25.	Deep plowing		2.00
	25.	Subsoil plowing		2.00
1892.				
Apr.	28.	Disk harrowing		0.38
	29.	Harrowing (twice, at 17 cents)		0.34
	30.	Rolling		0.17
	30.	Cost of seed (17 pounds, at 15 cents)		2.55
	30.	Drilling seed		0.52
	30.	Rolling		0.17
June	2.	Horse hoeing		0.62
	8–10.	Thinning out (sixty-five hours, at 12½ cents)		8.12
	17.	Hand hoeing amongst plants (fifty hours, at 12½ cents)		6.25
	21.	Horse hoeing		0.62
	27.	Horse hoeing		0.62
	30.	Horse hoeing		0.62
July	7.	Soiling up (twenty-nine hours, at 12½ cents)		3.62
				30.28
Oct.	15.	Getting up beets (by hand)	$13.50	
Oct.	15.	Transport (at 50 cents per ton)	6.00	
Oct.	15.	Rent of land	2.50	
				22.00
				52.28

The items of the above table express the actual cost of production of a given acre of beets, each detail being strictly recorded.

The acre plat selected for the expense control was the particular one most ravaged by the insects, and the yield was the lowest of all the plats.

The weight of beets grown upon the said acre was 12.5 tons. The price per ton obtained for the beets was $4. Therefore, 12.5 tons, at $4, equals $50; cost of production, $52.28; loss, $2.28.

The yield per acre of all the plats grown was 15.8 tons; 15.8 tons, at $4 per ton, equals $63.20; cost of production, $52.28; profit per acre, $10.92.

In considering the cost of production, as shown by the station records, it must be understood that each act of labor was purchased at market prices. Teams were hired at day prices, as were also the men. But accepting $52.28 as the total cost of producing an acre of beets by the best methods of culture, and with the purchase of all labor, that sum can be taken as a basis of calculation by the farmer.

SUMMARY.

In reviewing the records of the work in the season of 1892, we have to observe the following:

The first attempts made for the production of home-grown seed were successful. The yield and quality of the seed were satisfactory; and yet the indications were that, in a season of normal climatic conditions, the results of production would be notably greater.

The cultural season was marked by extreme departures from the normal in respect of climatic conditions. Great drought and high temperature prevailed during the period of maximum growth, which caused a smaller weight of beets per acre than would generally be produced. The dry period and high temperature, however, caused a great richness of sugar in the beet, and a satisfactory yield of sugar to the acre.

An insect attack wrought great ravage in the crop, which reduced very notably the results of production per acre.

The experiments conducted in order to determine the cause of decomposition and loss of sugar in the beets in storage indicated that the primary cause of loss is high temperature, and that a system of cold storage siloing would prevent the loss.

The cost of production per acre of beets was $52.28, and the mean value per acre of all the varieties $63.20, giving a profit of $10.92 per acre.

THE SUGAR-BEET WEB WORM.*

(*Loxostege sticticalis* Linn.)

Order LEPIDOPTERA; Family BOTIDÆ.

The present season has been marked by the appearance in very injurious numbers in parts of Nebraska of a comparatively new enemy to the sugar beet. Our first intimation of its appearance was through the Division of Chemistry of the Department. In connection with its work upon beet sugar this division has established a station at Schuyler, Colfax County, Nebr., and in the middle of July one of the experimental plats at the station was suddenly attacked by a multitude of small caterpillars, which riddled the leaves and occasioned considerable alarm. The fact was at once reported to the Department, and the advice sent, to spray with Paris green

* Advance sheets from report of Entomologist in Annual Report of the Secretary of Agriculture for 1892.

or London purple, was anticipated by an assistant, Mr. C. B. Edson, who was temporarily in charge during the absence of Mr. Walter Maxwell. Later communications from Mr. Maxwell gave us the history of the outbreak and its treatment. It seems that the caterpillars were first noticed on July 22, and when Mr. Maxwell returned on July 25 he found that the visitation was practically over, very few worms being found.

The suddenness of the attack is well indicated by a report which Mr. Edson prepared for Mr. Maxwell. On the morning of July 21 a few holes were observed on the leaves. These were attributed to one of the little leaf beetles. The next morning the farm foreman reported worms on the beets, and examination showed that four plats were more or less infested. In the afternoon one plat was seriously damaged and by night half of its foliage was destroyed, the remaining three plats being also quite seriously damaged. Paris green, Persian insect powder, and white hellebore were applied to a limited number of plants late in the evening. The Paris green was applied in the proportion of one teaspoonful to a gallon of water, and the insect powder and white hellebore were sprinkled as powders by hand over the beet tops. The next morning it was estimated that the Paris green had killed 10 per cent of the worms on the plants to which it had been applied, the Persian insect powder 50 per cent, and the white hellebore none. On account of lack of facilities for distributing the powder on a large scale, the Paris green solution was then sprinkled over plat A in the morning and plat B in the afternoon, 6 pounds of the green being used on 2 acres in the same proportion as in the preliminary experiment of the night before. In the evening the number of worms had apparently increased at least 20 per cent, according to Mr. Edson's statement, except upon plat A, where the Paris green was beginning to operate. On the morning of the 24th the work of the caterpillars on plats A and B was checked, but not stopped. Fifty per cent of the insects were dead upon plat A and less upon plat B. Check plats were still being injured. In the evening a comparatively small number of healthy caterpillars could be found upon the plats treated with Paris green. The next morning on no plant could more than one or two worms be found and many were entirely free. The untreated plats, however, were in much worse condition than the evening before. At noon more Paris green was secured, and one of the untreated plats was sprinkled. July 27 the damage was over.

Mr. Edson in his report calls attention to the extreme activity of the caterpillars and their seemingly incessant work. They chose the top leaves first, but when these were exhausted they worked toward the bottom and eventually ate the stem and foot-stalk of the leaf. When two caterpillars met they would strike viciously at each other with their heads a number of times, and frequently the caterpillar struck the leaf in the same way when unmolested. The efficacy of the Paris green treatment was abundantly proved, but the caterpillars were nearly full grown at the time of the first application and disappeared within a very few days even upon the untreated plants.

Mr. Lawrence Bruner, who has paid particular attention to the insects injurious to the sugar beet, gave some study to this species. From his report it appears that a few of the caterpillars were noticed during the summer of 1891 upon beets growing in the vicinity of Grand Island, Norfolk, and some of the adjoining towns which supply beets for the two factories in Nebraska. The present summer they again made their appearance in these same localities as well as at the Government station at Schuyler. More damage was done at the latter point than at any of the others. After the disappearance of the destructive brood a special inspection of the beet plats at the State Experiment Station at Lincoln resulted in the finding of a number of specimens of the caterpillar, and a little later it was found that at Norfolk, Pipe Center, and Genoa a number of fields had been stripped of their leaves. Other localities where beets were planted for the first season were visited, and while the worms were found they were in much smaller numbers than where beets had been

grown last season. The following facts were gathered by Mr. Bruner from conversation with various persons interested in the cultivation of the beets:

The web worms were most abundant at a distance from sheltered localities bordering groves, and were most numerous upon high ground, hilltops, and slopes rather than upon the flat ground. They were never plentiful on a piece of ground planted to beets for the first time, unless it adjoined one that was cultivated in beets the year before. They were more abundant in the middle of large fields than in small ones, and also in fields that were allowed to run to pigweed (*Amarantus* sp.) the proceding year than in fields where these weeds were kept down. Sandy soil was apparently more favorable to their increase than heavier soil.

LIFE HISTORY.

The life history of the insect has been followed through only a part of the season, but there are certainly two annual generations, and probably three if not four. The July brood is a short-lived one, and but two weeks are required between the maturity of the caterpillars transforming the latter part of July and the appearance of the moths, which couple and soon lay eggs for another generation. The caterpillars of the July brood transform to chrysalids almost immediately after entering the ground. Such, however, was not the case with the caterpillars of the last brood. With this the chrysalis state is normally not assumed for some time, and probably not until the ensuing spring. Cocoons received September 19 from Mr. Edson, at Schuyler, Nebr., contained larvæ which were full grown but somewhat shrunken, and these at the date of writing (December 5) are still in the larval condition. Mr. Bruner, however, in breeding-cage experiments, finds that some of the August brood issue as moths during September and October, and he suggests that it is barely possible that there is another set of caterpillars produced by these stragglers during the fall if the weather permits, but, as already shown, the majority of the August brood remained unchanged until the following spring. From the larvæ of the injurious brood received July 28 and August 2 the moths issued August 6, 8, and 12, while August 15 moths were received from Schuyler together with beet leaves bearing eggs.

The eggs are pale yellow, faintly rugose or indistinctly facetted, slightly polished, somewhat iridescent, almost circular and very flatly convex, and are deposited either singly or in a row of from two to five or more, in the latter case overlapping each other like scales.

The young larvæ are whitish in color with polished black head and piliferous spots. The full-grown larvæ are yellowish white with a broad black mediodorsal stripe, and a still broader subdorsal stripe, the two fine lateral lines being also black. The piliferous warts are pale with a black ring, and the head is yellowish or marbled with black. The hibernating caterpillars make a burrow beneath the surface of the ground, but line it with silk, constructing an inner cocoon which is long, slender, slightly curved, and about three times as long as the larva itself. A somewhat similar cocoon, but a little over half the length, is constructed by the midsummer brood.

This insect is a close ally of the so-called garden web worm, which was treated in the report of the Entomologist in the Annual Report of the U. S. Department of Agriculture for 1885 on pages 265–270. The moth is somewhat darker in general effect; the caterpillar is also darker, and the preponderance in the longitudinal markings shows a decided difference from the normal form of the ordinary garden web worm. It also differs in the apparent absence of the spinning habit in the immature larvæ.

It is one of the insects which, during my early visits to Kansas, and particularly in 1873, was not uncommonly found on *Amarantus blitum*, and was reared to the imago from larvæ upon this plant.

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U. S. DEPARTMENT OF AGRICULTURE

DIVISION OF CHEMISTRY

BULLETIN No. 39

EXPERIMENTS

WITH

SUGAR BEETS

IN

1893

BY

HARVEY W. WILEY

Chemist of the U. S. Department of Agriculture and Director of the Department Sugar Experiment Stations at Schuyler, Nebraska; Runnymede (Narcoossee P. O.), Florida, and Sterling and Medicine Lodge, Kansas

WITH THE COLLABORATION OF

DR. WALTER MAXWELL

Assistant in Charge of the Schuyler Station

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE

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BULLETINS OF THE DIVISION OF CHEMISTRY,

U. S. DEPARTMENT OF AGRICULTURE.

No. 1. An Investigation of the Composition of American Wheat and Corn. Edited by Clifford Richardson. 1883. Pp. 69. (Out of print.)

No. 2. Diffusion: Its Application to Sugar Cane, and Record of Experiments with Sorghum in 1883. Edited by H. W. Wiley. 1884. Pp. 36. (Out of print.)

No. 3. The Northern Sugar Industry: A record of its progress during the season of 1883. Edited by H. W. Wiley. 1884. Pp. 120. (Out of print.)

No. 4. An Investigation of the Composition of American Wheat and Corn. (Second report.) Edited by Clifford Richardson. 1884. Pp. 98. (Out of print.)

No. 5. The Sugar Industry of the United States. Edited by H. W. Wiley. 1885. Pp. 224. (Out of print.)

No. 6. Experiments with Diffusion and Carbonatation at Ottawa, Kans. Campaign of 1885. Edited by H. W. Wiley. 1885. Pp. 20. (Out of print.)

No. 7. Methods of Analysis of Commercial Fertilizers. (Proceedings of the Association of Official Agricultural Chemists, September 1 and 2, 1885.) Edited by Charles W. Dabney. 1885. Pp. 49. (Out of print.)

No. 8. Methods and Machinery for the Application of Diffusion to the Extraction of Sugar from Sugar Cane and Sorghum, and for the use of Lime and Carbonic and Sulphurous Acids in Purifying the Diffusion Juices. Edited by H. W. Wiley. 1886. Pp. 85. (Out of print.)

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No. 12. Methods of Analysis of Commercial Fertilizers. (Proceedings of the Third Annual Convention of the Association of Official Agricultural Chemists, August 26 and 27, 1886. Edited by Clifford Richardson. 1886. Pp. 59. (Out of print.)

No. 13. Food Adulterants.

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- Part Seventh. Tea, Coffee, and Cocoa Preparations. Edited by Guilford L. Spencer. 1892. Pp. 155.
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- Part Ninth. Bread, Flour, and Meal. (In preparation.)

No. 14. Record of Experiments at Fort Scott, Kans., in the Manufacture of Sugar from Sorghum and Sugar Canes in 1886. Edited by H. W. Wiley. 1887. Pp. 64.

No. 15. Report of Experiments in the Manufacture of Sugar at Magnolia Station, Lawrence, La., Season of 1886–'87. (Third report.) Edited by Guilford L. Spencer. 1887. Pp. 35.

No. 16. Methods of Analysis of Commercial Fertilizers, Feeding Stuffs, and Dairy Products. Adopted at the Fourth Annual Convention of the Association of Official Agricultural Chemists, August 16, 17, and 18, 1887. Edited by Clifford Richardson. 1887. Pp. 80. (Out of print.)

No. 17. Record of Experiments Conducted by the Commissioner of Agriculture in the Manufacture of Sugar from Sorghum and Sugar Canes at Fort Scott, Kans., Rio Grande, N. J., and Lawrence, La., 1887–'88. Edited by H. W. Wiley. 1888. Pp. 118.

No. 18. Sugar-producing Plants: Record of Analyses made by Authority of the Commissioner of Agriculture under direction of the Chemist, 1887–'88 (Sorghum—Fort Scott, Kans., Rio Grande, N. J.; Sugar Cane—Lawrence, La.), together with a study of the data collected on Sorghum and Sugar Cane. Edited by H. W. Wiley. 1888. Pp. 132.

No. 19. Methods of Analysis of Commercial Fertilizers, Cattle Foods, Dairy Products, Sugar, and Fermented Liquors. (Adopted at the Fifth Annual Convention of the Association of Official Agricultural Chemists, held at the U. S. Department of Agriculture, August 9 and 10, 1888.) Edited by Clifford Richardson. 1888. Pp. 96. (Out of print.)

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WASHINGTON

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1894

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., January 13, 1894.

SIR: I transmit herewith, for your inspection and approval, the manuscript of Bulletin 39 of the Division of Chemistry. This bulletin contains the results of the miscellaneous experiments in the culture of sugar beets in various parts of the United States, and of the experiments in the same line of work conducted by the Department at Schuyler, Nebr., during the season of 1893.

Respectfully,

H. W. WILEY,
Chief of the Division of Chemistry and Director of the Experiment Station at Schuyler

HON. J. STERLING MORTON,
Secretary of Agriculture.

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EXPERIMENTS WITH SUGAR BEETS IN 1893.

WORK OF THE YEAR.

In harmony with the provisions of the act of Congress for experiments in the improvement of sugar-producing plants and the manufacture of sugar therefrom, and by direction of the Secretary of Agriculture, the work of the Department in this direction was continued in two distinct lines.

The first of these consisted in the distribution of beet seed to those interested in the culture of the beet, as indicated in the report of last year. The Department having made no purchase of beet seed for distribution, Mr. H. T. Oxnard kindly donated for its use a sufficient amount of the best imported seed.

SUGAR-BEET SEED DISTRIBUTED.

The number of packages of seed sent out was 2,428, and the number of persons to whom sent, 348. The number of packages sent to each of the different States and Territories receiving seed was as follows:

	Packages.		Packages.
Alabama	12	Nebraska	120
Arizona	1	Nevada	50
Arkansas	32	New Jersey	10
California	347	New Mexico	52
Colorado	202	New York	90
Connecticut	1	North Carolina	5
Delaware	10	North Dakota	34
Florida	3	Ohio	68
Georgia	200	Oklahoma	8
Idaho	4	Oregon	6
Illinois	17	Pennsylvania	3
Indiana	83	Rhode Island	3
Iowa	62	South Dakota	176
Kansas	12	Tennessee	15
Kentucky	3	Texas	4
Louisiana	111	Virginia	33
Maine	1	Washington	250
Maryland	13	West Virginia	1
Michigan	43	Wisconsin	219
Minnesota	69	Wyoming	12
Mississippi	14		
Missouri	27		
Montana	2	Total	2,428

The number of packages of seed distributed was far less than in previous years, and the number of samples received for analysis was correspondingly diminished. The total number of samples received at the Chicago laboratory was 199, and the total number of samples received at the Washington laboratory was 84.

Accompanying each package of seed there was sent a copy of Farmers' Bulletin No. 3, which contains detailed instructions for preparing the land, planting the seed, and cultivating the beet.

SUGAR-BEET ANALYSES AT WORLD'S FAIR.

Arrangements were also made for taking samples for analysis, and these samples were sent chiefly to the chemical laboratory of the Department at the World's Columbian Exposition. As has already been indicated, one of the chief features of the chemical laboratory at the Exposition was the arrangement for the analysis of beets. In addition to this the Chicago laboratory was nearer to the localities in which the beets were chiefly grown, so that they could be sent for analysis in a shorter time than if forwarded to Washington. It was thought, also, that it would be an excellent illustration of the practical work of the laboratory to have the analyses made where they could be viewed by those interested. The wisdom of this course was apparent from the fact that at all times when analyses of beets were in progress large numbers of intelligent observers were watching the work. The questions which they asked showed that they were interested in the process and were receiving valuable instruction from observing it. Some of the samples of beets, however, were sent to the laboratory at Washington for examination.

UNSATISFACTORY RESULTS OF EXPERIMENTS.

The general results of the work this year were somewhat discouraging as compared with previous years. Throughout a great part of the beet-growing region the summer was excessively dry, and large numbers of total failures were reported.

In former reports attention has been called to the fact that the present method of experiment is unsatisfactory, and the reasons therefor have been fully set forth. The farmers are so busy with other work that, as a rule, they are not able to give the proper attention to the experimental details. They do not have the time to properly prepare the soil for beet culture nor do they give the growing beet proper attention. When the time for harvesting comes they are usually engaged in other farm work, so that the beets are not harvested at the proper time nor are proper data obtained by means of which any accurate estimate of the yield per acre can be determined. The analytical data, therefore, of such work are usually fragmentary and far from teaching any valuable lesson in regard to the industry itself. In general, how-

ever, the data bear out those of previous years in showing the areas in this country where the best beets can be grown. It is in these regions that the development of the industry must be expected.

There is probably not a State or Territory in the Union which is not capable of growing a fair article of sugar beets. Even in the far south beets of fair sugar content have been produced and with good tonnage; but when the competition of the world is to be met, with the price of sugar as low as it is now, only those parts of the country where the soil and climate are especially favorable can be expected to compete successfully with the beet-sugar industry already firmly established in older countries. The sole valuable lesson, therefore, of the promiscuous distribution of beet seed is in the fact that as a rule those regions best suited to the growth of the sugar beet will gradually be outlined, and intending investors led to the proper localities for the establishment of factories.

The great success of the beet-sugar industry on the Pacific coast leads to the conclusion that if the northern part of the eastern and central portions of our country is to become the seat of a great sugar industry, every possible advantage must be taken of soil and location in order to compete successfully with the beet fields of California, Washington, and Oregon.

RESULTS OF ANALYSES OF BEETS RECEIVED.

In the following table are given (by counties and States) the results of the analyses of the samples received from each State:

Table of analyses of beets grown in different parts of the

ALABAMA.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
1	H. L. Oliver	Calera	Shelby		

COLORADO.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
17252	F. W. Kraeger	Cortez	Montezuma	Vilmorin	May 5
22	Louis Lauer	Montrose	Montrose	Kleinwanzlebener	Apr. 25
87	F. A. Huntley	Rocky Ford	Otero	Vilmorin's Improved.	May 16
88	do	do	do	Dippe's Kleinwanzlebener.	May 17
89	do	do	do	Vilmorin's Richest	do
90	do	do	do	Vilmorin's Improved.	May 16
91	do	do	do	Knauer's Imperial	May 17
92	do	do	do	Silesian	do
93	do	do	do	do	June 7
94	do	do	do	Vilmorin's Improved.	June 5
17323	Doch Seaman	do	do	Vilmorin	
17324	do	do	do	Kleinwanzlebener	

IDAHO.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
161	Joseph L. Hagemann	Genesee	Latah		May 15
162	Edward Kempf	do	do		May 9

INDIANA.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
17250	Snead Thomas	Marion	Grant	Kleinwanzlebener	May 10
99	John Hains	Pendleton	Madison	Knauer's Imperial	May 20
17328	Chas. F. Muth	Morristown	Shelby		

IOWA.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
17257	W. J. Grunewald	Blairstown	Benton	Vilmorin's Richest	May 20
17258	do	do	do	Kleinwanzlebener	do
17262	do	do	do	Knauer's Imperial	do
17313	Henry Bash	Conrad Grove	Grundy		
61	G. A. Ivins	Iowa Falls	Hardin		May 1
17314	A. A. Berry	Clarinda	Page		May 30

KANSAS.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
59	H. G. Lamson	Girard	Crawford	Knauer	Apr. 15

LOUISIANA.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
46	John J. Bailey	Shreveport	Caddo		May 17
175	do	do	do	Vilmorin's Richest	do

MICHIGAN.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
14	Sanford Rogers	Hastings	Barry	Kleinwanzlebener Elite No. 1.	May 2
17253	Christian Voss	Frankenlust	Bay		
17254	William Renther	Salzburg	do		

United States from seed distributed by the Department.

ALABAMA.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Average weight. Grams.	Average weight. Oz.	Total solids.	Sucrose in— Juice. Per ct.	Sucrose in— Beets. Per ct.	Purity.
						9·31	6·2	5·9	66·7

COLORADO.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Grams.	Oz.	Total solids.	Juice.	Beets.	Purity.
Oct. 25				535	19		18·7	17·8	83·7
Sept. 22	Reddish coarse sand					19·33	17	16·2	88·1
Oct. 6	Sandy clay loam	Irrigated land	2	360	12·5	19·67	14·9	14·2	75·7
...do	...do	Hail destroyed tops July 8.	2	325	11·5	21·67	17·4	16·5	80·2
...do	...do	...do	2	467	16·5	20·33	15·9	15·1	78·4
...do	...do	...do	2	226	8	19·23	14·6	13·9	76·1
...do	...do	...do	2	354	12·5	20·53	16·8	16	81·4
...do	...do	...do	2	339	12	16·50	11·4	10·8	69·1
Oct. 7	...do	...do	2	474	17	12·10	8·7	8·3	71·9
...do	...do	...do	2	1,160	41	13·61	7·5	7·1	55·1
				395	Samples too small for analysis.				
				262					

IDAHO.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Grams.	Oz.	Total solids.	Juice.	Beets.	Purity.
Oct. 10	Black loam	Beets frozen once	1	1,797	63·5	14·70	11·4	10·8	77·5
Oct. 6	...do		1	2,589	91·5	13·50	10·1	9·6	74·8

INDIANA.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Grams.	Oz.	Total solids.	Juice.	Beets.	Purity.
Oct. 19				242	8·5		13·1	12·4	81·5
Oct. 8	Gravelly clay		2	283	10	16·66	12	11·4	71·9
				293	10·5		8·1	7·7	67·1

IOWA.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Grams.	Oz.	Total solids.	Juice.	Beets.	Purity.
Oct. 30	Sandy loam	Used for truck farm'g		165	5·5		15·6	14·8	72·9
...do	...do			220	7·5		15·2	14·4	81·3
...do	...do	Used for truck farm'g		285	10		13·3	12·6	74
		Season dry		535	18·9		14·8	14·1	81·3
Oct. 24	Sandy		2	587	21	16·07	12·1	11·5	75·1
Nov. 6	Black prairie loam	Season dry		915	32·3		11	10·5	71

KANSAS.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Grams.	Oz.	Total solids.	Juice.	Beets.	Purity.
Sept. 20	Black limestone					20·56	15	14·3	72·8

LOUISIANA.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Grams.	Oz.	Total solids.	Juice.	Beets.	Purity.
Oct. 2	Red sandy loam	Fertilized with stable manure.				11·57	7·8	7·4	67·2
Oct. 18	...do	...do	2	333	11·5	14·68	10·2	9·7	69·4

MICHIGAN.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Grams.	Oz.	Total solids.	Juice.	Beets.	Purity.
Sept. 22	Black swamp muck	Tile drainage; no fertilizer.				15·36	9·9	9·4	64·3
				835	29		16·1	15·2	82·2
				1,565	55		7·8	7·4	61·9

Table of analyses of beets grown in different parts of the United

MICHIGAN—Continued.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
17263	J. H. Coon, care of McGraw & Co.	Portsmouth	Bay	Vilmorin's Imperial	May 20
17264	do	do	do	Kleinwanzlebener	do
17265	do	do	do	French sugar red top	do
17266	do	do	do	Florimond Desprez	do
17267	do	do	do	Knauer's Imperial	do
17268	do	do	do	do	do
17269	Owen Hawkins	do	do	French sugar red top	May 25
17270	do	do	do	Florimond Desprez	do
17271	do	do	do	Kleinwanzlebener	do
17272	do	do	do	Vilmorin's Imperial	do
17273	G. W. Green	do	do	French sugar red top	June 4
17274	do	do	do	Knauer's Imperial	do
17275	do	do	do	Kleinwanzlebener	do
17276	do	do	do	Florimond Desprez	do
17277	do	do	do	Vilmorin's Imperial	do
17278	do	do	do	Vilmorin's Richest	do
17279	do	do	do	Dippe's Imperial	do
17280	Berth Bros	do	do	Kleinwanzlebener	May 29
17281	Robert Nivens	do	do	do	June 6
17282	Lobden	do	do	do	May 26
17283	John H. Potter	do	do	do	May 29
17284	Hopkins & Bartlett	do	do	do	May 21
17285	H. Lambrecht	do	do	do	June 3
17286	John Currion	do	do	Vilmorin's Richest	May 10
17287	C. B. Chatterfield farm	do	do	Kleinwanzlebener	May 21
17288	John Lunden	do	do	do	May 20
17289	H. P. Matts	do	do	Vilmorin's Imperial	May 19
17290	F. Fischer	do	do	Kleinwanzlebener	May 18
17291	Joseph H. Potter	do	do	Vilmorin's Imperial	May 29
17292	William Merritt	do	do	do	June 2
17293	J. Currion	do	do	Kleinwanzlebener	May 18
17294	J. Lunden	do	do	Vilmorin's Imperial	May 20
17295	A. B. Henry	do	do	Kleinwanzlebener	June 3
17296	Wm. Merritt	do	do	do	June 2
17297	H. Lambrecht	do	do	Vilmorin's Imperial	June 3
17298	H. P. Matts	do	do	Florimond Desprez	May 19
17299	Ed. Lambrecht	do	do	Kleinwanzlebener	May 26
17300	Bird Shuler	do	do	Dippe's Kleinwanzlebener.	June 18
17301	C. B. Chatterfield farm	do	do	Florimond Desprez	May 21
17302	Hopkins & Bartlett	do	do	French sugar red top	do
17303	Berth Bros	do	do	Vilmorin's Imperial	May 29
17304	J. Currion	do	do	Dippe's Kleinwanzlebener.	May 10
17305	McGraw's farm	do	do	Kleinwanzlebener	June 10
17306	H. P. Matts	do	do	do	May 19
17307	Bird Shuler	do	do	do	June 18
17308	Robert Nivens	do	do	Florimond Desprez	June 6
17309	C. B. Chatterfield farm	do	do	Vilmorin's Imperial	do
17310	J. Currion	do	do	do	May 10
17311	Lewis Knight	do	do	Kleinwanzlebener	May 29

MINNESOTA.

8	Perry E. Reynolds	West Concord	Dodge	Knauer No. 1	May 27
128	Riley Mantor	Mantorville	do	Lemaire No. 2	May 16
171	do	do	do	do	do
74	John Buckley	Minneota	Lyon	Knauer	May 17

MONTANA.

185	Julius C. Martin	Evans	Cascade	Lemaire	May 12

States from seed distributed by the Department—Continued.

MICHIGAN—Continued.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Average weight.		Total solids.	Sucrose in—		Purity.
							Juice.	Beets.	
				Grams.	*Oz.*		*Per ct.*	*Per ct.*	
Nov. 2	Sandy loam		2	475	16·5	......	13·1	12·4	77·5
...do	...do		2	490	17·3	......	10	9·5	69
...do	...do		2	345	10·5	......	13·8	13·1	79·8
...do	...do		2	450	16	......	16	15·2	83·3
...do	...do		2	400	14	......	15·8	15	85·4
...do	...do		2	405	14·5	......	14·8	14·1	80
...do	...do		2	450	16	......	13·5	12·8	82·3
...do	...do		2	480	16·9	......	13·5	12·8	84·4
...do	...do		2	520	18·5	......	15·1	14·3	86·3
...do	...do		2	435	15·2	......	14·9	14·2	89·2
Nov. 4	...do		2	400	14	......	14·6	13·9	85·4
...do	...do		2	355	12·5	......	17·3	16·4	87·4
...do	...do		2	510	18	......	14·4	13·7	84·7
...do	...do		2	515	17·8	......	16	15·2	81·2
...do	...do		2	435	15	......	16·3	15·5	85·3
...do	...do		2	425	15	......	17·2	16·3	86·9
Nov. 6	...do		2	410	14·4	......	14·9	14·2	83·2
Nov. 1	...do		2	464	16·4	......	15	14·3	83·3
Oct. 25	...do		2	374	13·2	......	14·6	13·9	81·6
Nov. 1	Clay loam	At Collins' farm	2	425	14·9	......	13·7	13	88·4
Nov. 7	Sandy loam		2	485	17·1	......	14·8	14·1	91·4
Nov. 1	...do		2	420	14·8	......	13	12·3	79·3
Oct. 28	Clay loam		2	430	15·2	......	13·5	12·8	82·3
Nov. 4	...do		2	310	10·9	......	17	16·3	88·1
Nov. 1	...do		2	403	14·1	......	16	15·2	87
Nov. 5	Sandy loam		2	416	14·7	......	13·5	12·8	83·8
Nov. 4	...do		2	406	14·3	......	15·6	14·8	84·3
Nov. 2	Loamy clay		2	404	14·3	......	15·5	13·8	85·8
Nov. 7	Sandy loam		2	442	15·6	......	13·7	13	83·5
Nov. 6	...do		2	444	15·7	......	15	14·3	83·3
Nov. 9	Loamy clay		2	429	15·1	......	12·7	12·1	85·8
Nov. 5	Sandy loam		2	367	12·9	......	13	12·3	86·1
Nov. 6	...do		2	408	14·4	......	11·7	11·1	80·7
...do	...do		2	529	18·5	......	12·7	12·1	81·9
Oct. 28	Loamy clay		2	394	13·8	......		Lost.	
Nov. 4	Sandy loam		2	428	15·1	......	14·2	13·5	87.1
Nov. 3	...do		2	356	12·6	......	16	15·2	86·9
Nov. 8	...do	Oxnard's seed	2	449	15·9	......	15·8	15	86·8
Nov. 1	Loamy clay		2	449	15·8	......		Lost.	
...do	Sandy loam		2	358	12·6	......	15·4	14·6	85·1
...do	...do		2	330	11·6	......		Lost.	
Nov. 4	Loamy clay		2	313	11	......		Lost.	
...do	...do		2	375	13·2	......	16·2	15·4	87·6
...do	Sandy loam		2	370	13	......	15·3	14·5	85
Nov. 8	...do		2	360	12·7	......	15·7	14·9	85·8
Oct. 25	...do		2	283	10	......		Lost.	
...do	...do		2	460	16·2	......	12·9	12·3	79·7
Nov. 7	...do		2	455	16·1	......		Lost.	
Oct. 29	...do		2	431	15·2	......	12·9	12·3	80·6

MINNESOTA.

Sept. 12	Black yellow subsoil	No fertilizer	....	....	......	16·93	13·2	12·5	78
Oct. 9	Black prairie loam	...do	2	2,702	95·5	10·86	6·8	6·5	62·6
...do	...do	...do	2	2,045	70·5	14·28	9·3	8·8	65
Sept. 25	Black sandy loam	...do	2	375	13	21·30	17·3	16·4	81·1

MONTANA.

Oct. 4	Black loam		2	431	15	20·04	15	14·3	75

Table of analyses of beets grown in different parts of the United

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
			NEBRASKA.		
104	U. S. Experiment Station.	Schuyler	Colfax	Desprez No. 2	
105	do	do	do	do	
106	do	do	do	do	
163	Fred Maseberg	Thedford	Thomas	Vilmorin's Improved Imperial.	May 5
			NORTH CAROLINA.		
3	E. S. Shiver	Rocky Point	Purdee		
			NORTH DAKOTA.		
167	T. N. Orum	Lisbon	Ransom		May 19
			PENNSYLVANIA.		
45	J. A. McGranahan	Kennard	Mercer	Kleinwanzlebener	May 30
			VIRGINIA.		
17329	O. K. Lapham & Co.	Staunton	Augusta		
17330	do	do	do		
17331	do	do	do		
17332	do	do	do		
17333	do	do	do		
17334	do	do	do		
17335	do	do	do		
			WASHINGTON.		
31	J. O'Keefe	Asotin	Asotin		May 10
32	do	do	do		May 15
156	do	do	do	Kleinwanzlebener	May 12
157	do	do	do	do	do
129	M. Pictozicki	Dayton	Columbia		May 11
165	H. T. Hudson	Waterville	Douglas	Kleinwanzlebener	Apr. 4
166	do	do	do	Dippe's Kleinwanzlebener.	Apr. 16
17318	Geo. W. Elliott	Ellensburg	Kittitas		June 5
17319	Harry Walden	do	do		May 26
34	David T. Hain	Latah	Spokane		May 25
36	B. F. Copler	do	do		May 18
37	Roncisco J. Davis	do	do		June 1
38	Geo. W. Copelan	do	do		May 20
164	Chest. Gifford	do	do		do
41	E. H. Morrison	Fairfield	do	Vilmorin's Richest	June 4
42	do	do	do	Florimond Desprez	do
43	do	do	do	Knauer's Imperial	June 3
44	do	do	do	Kleinwanzlebener	June 4
183	do	do	do	do	
184	do	do	do	Knauer's Imperial	
190	do	do	do	Vilmorin's Richest	
191	do	do	do	Florimond Desprez	

States from seed distributed by the Department—Continued.

NEBRASKA.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Average weight.		Total solids.	Sucrose in—		Purity.
							Juice.	Beets.	
				Grams.	*Oz.*		*Per ct.*	*Per ct.*	
			2	552	19·5	14·09	9·3	8·8	65·9
			2	312	11	13·69	8·5	8·1	62·1
			2	418	15	15·19	10·7	10·2	70·4
Oct. 6	Black sandy loam		2	665	23·5	17·40	14	13·3	80·5

NORTH CAROLINA.

						8·35	4·4	4·1	52·1

NORTH DAKOTA.

Oct. 19	Black sandy loam	Last crop Mangel-wurzel.	2	615	27	18·19	14·7	14	80·7

PENNSYLVANIA.

Oct. 4	Black, sandy	Previously used bone fertilizer.				14·67	11·6	11	78·9

VIRGINIA.

		Smart's field	3	480	17		13·8	13·1	80·1
		Folly mills	3	470	17·3		15·2	14·4	87·7
		Lagrange farm	4	286	14·4		11·9	11·3	82·7
		Folly mills					14·5	13·7	82·4
		O. K. Lapham farm					15·5	14·7	81·6
		Smart farm					15·2	14·3	81·5
		Harrison farm					17·1	16·3	85

WASHINGTON.

Sept. 15	Gray loam	Irrigated				15·46	11·8	11·2	78·1
Sept 5	Sandy loam	Raised on farm of L. M. Troyer.				19·86	16·4	15·6	82·4
Oct. 6	Gray loam, some alkali.	Irrigated every two weeks.	1	948	33·5	17·47	13·1	12·4	74·8
...do	....do	...do	1	1,274	45	15·67	11·2	10·6	71·3
Oct. 2	Sandy bottom land	Cultivated twice	2	906	32	12·46	8·3	7·9	66·4
Oct. 10	Decomposed volcanic rock.		1	396	14		14·8	14·1	
...do	....do		1	283	10		15·7	14·9	
Oct. 25				613	21·5		17·4	16·5	86·6
Nov. 9	Black sandy loam			345	12		16·5	15·7	75·8
Sept. 26	Black loam	No cultivation				16·41	13·6	12·9	83
Sept. 25	......do					15·81	12	11·4	76
Sept. 26	......do					17·91	14·6	13·8	82·1
Sept. 20	Loam					18·11	14·8	13·9	81·7
Oct. 10	Prairie loam		2	1,967	69·5	16·50	11·8	11·2	71·5
Sept. 28	Black prairie loam					18·60	15	14·3	80·7
...do	....do	Natural drainage				17·11	12·4	11·8	72·5
...do	....do	....do				19·60	15·3	14·5	78·1
...do	....do	....do				19·10	14·9	14·2	77·9
Oct. 15			2	1,076	38	17·05	11·9	11·3	70
...do			2	942	33	17·94	13·7	13	76
...do			2	573	20	18·15	14	13·3	76·9
...do			2	672	23	13·96	9·6	9·1	68·5

Table of analyses of beets grown in different parts of the United

WASHINGTON—Continued.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
192	E. H. Morrison	Fairfield	Spokane	Kleinwanzlebener	
193	do	do	do	Florimond Desprez	
194	do	do	do	Kleinwanzlebener	
195	do	do	do	do	
196	do	do	do	Vilmoni Amelioree	
197	do	do	do	Kleinwanzlebener	May 29
198	do	do	do	Vilmoni Amelioree	do
199	do	do	do	Florimond Desprez	do
62	C. R. Burns	Spokane	do	Kleinwanzlebener	May 16
178	A. Lefevre	Medical Lake	do	Knauer's Imperial	do
182	Henry Hashagen	do	do	do	May 15
55	D. F. Lucas	Chewelah	Stevens	Kleinwanzlebener	May 6
181	Dr. N. G. Blalock	Walla Walla	Walla Walla		Apr. 23
6	F. A. Craig	Tekoa	Whitman	do	May 16
7	William Button	do	do	do	May 10
11	O. N. Sparks	do	do	do	May 2
12	Thomas Hill	do	do	do	May 1
15	D. C. Sparks	do	do	do	May 9
16	William Hoar	do	do	do	May 15
17	Aiden Page	do	do	do	May 2
18	D. A. Hoffmann	do	do	do	June 1
19	C. R. Sparks	do	do	do	May 20
20	Henry Mustoe	do	do	do	May 5
21	B. E. Wilson	do	do	do	May 16
23	J. A. Sanders	do	do	do	May 30
24	K. T. Sparks	do	do	do	May 28
25	George Erwin	do	do	do	May 30
26	J. Sparks	do	do	do	June 1
27	John Erwin, sr	do	do	do	May 30
28	William Erwin	do	do	do	June 2
29	John Erwin	do	do	do	June 3
30	John McDonald	do	do	do	June 1
51	J. Ritzloff	do	do	do	May 20
52	A. B. Luper	do	do	do	May 29
53	James Lindsay	do	do	do	May 15
54	Daniel Johnson	do	do	do	May 27
65	Henry Westermann	do	do	do	May 22
66	G. T. Smith	do	do	do	May 12
67	Wm. Hart	do	do	do	May 19
68	S. G. Jamison	do	do	do	May 30
69	Thomas Warwick	do	do	do	May 2
70	Dan Calland	do	do	do	May 16
71	K. Tylor	do	do	do	May 3
72	William Warwick	do	do	do	May 9
73	A. J. Sharrod	do	do	do	May 20
75	E. J. Moak	do	do	do	May 29
76	David Jones	do	do	do	do
77	H. H. Noble	do	do	do	May 9
78	Joseph Bertholff	do	do	do	May 28
79	Wm. McBride	do	do	do	May 27
80	Gus. Willoughby	do	do	do	May 26
81	Wm. Franklin	do	do	do	June 1
82	John Westermann	do	do	do	May 1
83	David Bertholf	do	do	do	May 27
84	William Sennott	do	do	do	June 2
85	James Carbery	do	do	do	May 11
86	James Bertholf	do	do	do	May 30
97	Peter Campbell	do	do	do	May 28

States from seed distributed by the Department—Continued.

WASHINGTON—Continued.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Average weight.		Total solids.	Sucrose in—		Purity.
							Juice.	Beets.	
				Grams.	*Oz.*		*Per ct.*	*Per ct.*	
Oct. 15			2	1,054	37	15·16	10·8	10·3	71·1
...do			2	290	10	19·54	16·8	16	86·2
...do			2	630	22	17·85	13·9	13·2	77·7
...do			2	325	9·5	19·54	15·5	14·7	79·5
...do			2	191	7	20·14	17·1	16·2	85
...do	Black prairie loam	Not drained; hill land.	2	226	8	22·03	18·7	17·8	84·9
...do	Black loam		2	177	6	19·24	16·4	15·6	85·4
...do	...do		2	488	17	17·45	13·8	13·1	78·8
Oct. 4	...do	Yellow subsoil	2	665	23·5	17·67	13·7	13	77·4
Oct. 16	Black sandy soil	No fertilizer in cultivation 16 years.	2	566	20	19·88	16·4	15·6	83·3
Oct. 17	Black prairie loam		2	1,245	44	19·24	14·8	14·1	77·1
Sept. 25	Gray loam, clay subsoil.					16·86	13	12·4	77
Oct. 14	Light volcanic	Irrigated occasionally.	2	1,860	65·5	14·31	10·9	10·4	76·2
Sept. 7	Volcanic black loam.	No rain nor irrigation				15·17	11·1	10·6	73·2
Sept. 12	Black prairie loam	No fertilizer				14·63	9·6	9·1	65·6
Sept. 18	Deep black loam					20·43	10·8	10·3	52·9
...do	Volcanic black loam.	Cultivated once				17·53	8·3	7·9	47·3
...do	Deep black loam	No fertilizer				18·13	9·9	9·4	54·6
Sept. 21	Sandy and dry					18·63	14	13·3	75·3
...do	Volcanic black loam.					16·43	11·8	11·2	72
...do	Black loose loam	On north hillside				16·53	11·5	10·9	69·7
...do	Volcanic loam	No fertilizer				17·83	13·5	12·8	75·9
Sept. 22	Black loam	Bottom land				16·63	11·4	10·8	68·6
Sept. 21	Black loam, volcanic.	...do				16·73	12·5	11·9	74·9
Sept. 24	...do	No fertilizer				16·66	11·3	10·7	66·7
Sept. 23	Gravelly loam	...do				14·36	9·3	8·8	64·5
...do	Black sandy loam	Subsoil clay				14·56	9·9	9·4	67·8
...do	...do	No fertilizer				16·96	12·2	11·6	71·7
...do	Deep black clay	Sandy				18·16	12·5	11·9	68·6
...do	Black sandy loam	Pine land				17·56	11·7	11·1	66·5
...do	Black loam, volcanic.	No fertilizer				18·36	13·7	13	74·4
...do	Black volcanic loam.					19·06	15·5	14·7	81·5
Oct. 1	...do	No fertilizer				17·76	13·3	12·6	74·7
...do	...do	...do				18·76	14·5	13·8	77·1
Oct. 2	Deep black loam	South hillside				16·16	11·5	10·9	71
Oct. 1	Deep black pine land.					19·66	15	14·3	76·2
Oct. 5	Deep black loam	South hillside, no fertilizer.	1	1,104	47.	19·68	15	14·3	77·7
...do	Heavy loam	No fertilizer	1	665	23·5	16·58	11·5	10·9	69·2
...do	Deep black loam	Bottom land	1	1,457	51·5	18·88	13·6	12·9	71·9
...do	Black volcanic loam.	No fertilizer	1	1,373	48·5	15·38	10·7	10·2	69·4
...do	Black loam tableland.		1	976	34·5	19·19	16	15·2	83·4
...do	Black clay loam	Volcanic formation	1	1,373	48·5	15·28	10·6	10·1	69·3
...do	Black loam, north slope.		1	2,321	82	13·77	8·9	8·5	64·5
...do	...do	No fertilizer	1	877	31	16·39	12	11·4	73·2
...do	Volcanic loam	...do	1	1,358	48	16·59	12·5	11·9	75·3
Oct. 6	Black prairie land	No fertilizer, volcanic.	1	863	30·5	17·84	12·3	11·7	69·1
...do	Black volcanic loam.	High table-land	1	368	13	18·91	13·3	12·6	70·4
Oct. 5	...do	High, dry pine land	1	382	13·5	17·54	11·7	11·1	66·8
Oct. 6	Light pine land	No fertilizer	1	736	26	17·74	12·3	11·7	69·5
...do	Black prairie loam	Volcanic formation	1	523	18·5	17·54	13·2	12·5	75·4
	Light sandy loam		1	1,259	44·5	16·64	11·4	10·8	68·6
Oct. 6	Sandy loam, pine land.		1	495	17·5	16·47	11	10·5	66·7
Oct. 5	Black volcanic loam	No fertilizer nor irrigation.	1	906	32	14·37	9	8·6	62·5
Oct. 6	Light sandy soil		1	792	28	15·97	10	9·5	62·5
...do	Black prairie land	No fertilizer	1	509	18	14·53	9·1	8·6	62·8
Oct. 5	Black loose loam		1	1,641	58	14·77	9·8	9·3	66·2
Oct. 6	Light pine tableland.	No fertilizer	1	1,203	42·5	14·97	10	9·5	66·7
Oct. 5	Deep black loam	No fertilizer nor irrigation.	1	1,019	36	16·96	11·9	11·3	70

Table of analyses of beets grown in different parts of the United

WASHINGTON—Continued.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
98	James Campbell	Tekoa	Whitman	Kleinwanzlebener	May 19
107	John Schon	do	do	do	May 30
108	John Fenn	do	do	do	do
109	Ben Carl	do	do	do	May 18
110	N. B. Welton	do	do	do	May 28
111	Joab Robertson	do	do	do	May 31
112	George Prettiman	do	do	do	May 28
113	J. Romine	do	do	do	May 21
114	Grant Palmer	do	do	do	May 26
115	F. S. Cornell	do	do	do	May 23
116	D. W. Bridgeman	do	do	do	May 27
117	Knute Ericson	do	do	do	June 1
118	A. B. Walker	do	do	do	May 24
119	A. B. Willard	do	do	do	May 28
120	R. T. Smiley	do	do	do	May 24
121	J. A. Gunn	do	do	do	May 28
122	William Breen	do	do	do	May 29
123	W. B. Smith	do	do	do	May 31
124	John Conger	do	do	do	May 23
125	John England	do	do	do	May 19
126	A. N. Hoffman	do	do	do	May 24
130	G. R. Winslow	do	do	do	May 18
131	G. T. Huffman	do	do	do	May 29
132	Cornelius Kole	do	do	do	May 20
133	O. R. McDonald	do	do	do	May 30
134	William Click	do	do	do	June 1
135	J. B. Sampter	do	do	do	May 19
136	John Stevens	do	do	do	May 30
137	A. Goddard	do	do	do	do
138	A. J. Bancroft	do	do	do	May 23
139	H. D. Kay	do	do	do	May 26
140	Austin Footer	do	do	do	May 30
141	Ed. Trammill	do	do	do	May 24
142	George Steen	do	do	do	May 29
143	Alexander Tomblinson	do	do	do	May 28
144	J. S. Young	do	do	do	May 22
145	Matt Fountain	do	do	do	May 20
146	J. T. Whaley	do	do	do	May 21
147	O. C. Daley	do	do	do	do
148	James Storey	do	do	do	May 28
149	Thos. Balkow	do	do	do	May 20
150	J. Bayles	do	do	do	May 25
151	H. Goddard	do	do	do	May 23
152	Henry Howard	do	do	do	May 28
153	Chas. H. Strope	do	do	do	May 26
154	C. Strope	do	do	do	May 20
155	James Tyson	do	do	do	May 28
13	F. E. Deeringhoff	Uniontown	do	Elite No. 2	May 19
168	do	do	do	Desprez	do
169	do	do	do	Elite No. 2	do
170	do	do	do	Dippe	do
172	do	do	do	Knauer	do
173	do	do	do	Lemaire	do
174	do	do	do	Desprez No. 2	do
176	do	do	do	Kleinwanzlebener	do
177	do	do	do	Lemaire	do
179	do	do	do	Elite No. 2	do
103	Sardis I. Brockway	Rosalia	do	Elite	May 13
95	Geo. P. Tolton	do	do	German sugar beet	May 10
96	do	do	do	do	Apr. 20
158	Evan Peddicord	Palouse	do		June 12
17322a	F. M. Jeffries	do	do		
17322b	do	do	do		
17322c	do	do	do		
17325	C. J. Rumens	do	do		June 3
17259	Geo. Ruedy	Colfax	do	Kleinwanzlebener	
17260	do	do	do	Vilmorin's Richest	
17261	do	do	do	Knauer's Imperial	
17320	J. T. Edge	Palouse	do		June 1

States from seed distributed by the Department—Continued.

WASHINGTON—Continued.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Average weight.		Total solids.	Sucrose in—		Purity.
							Juice.	Beets.	
				Grams.	*Oz.*		*Per ct.*	*Per ct.*	
Oct. 5	Black volcanic loam.	No fertilzer nor irrigation.	1	877	31	16·76	11·8	11·2	70·2
Oct. 9	Grass lands	Land cultivated 9 years.	1	976	34·5	17·92	14·3	13·6	79·9
Oct. 6	Black loose loam		1	877	31	16·01	11·5	10·9	71·9
Oct. 9	Black prairie land	No cultivation	1	283	10		11·4	10·8	
do	Prairie land	In wheat 9 years	1	608	21·5	17·13	11·6	11	67·9
do	Prairie land, moist	No cultivation	1	495	17·5	15·93	11·2	10·6	70·4
do	Black loam	Land cultivated 13 years.	1	481	17	15·23	9·7	9·2	63·8
do	do	In wheat 3 years	1	325	11·5	16·96	11·8	11·2	69·4
do	Black fertile loam	Ground very hard	1	538	19	17·86	13·2	12·5	74·2
do	Prairie land	Beets not cultivated.	1	651	23		16·4	15·6	
do	Black prairie loam		1	325	11·5	17·66	11	10·5	62·2
do	Deep black prairie soil.	No cultivation	1	382	13·5	18·53	13·9	13·2	75·1
do	Cultivated prairie	Ground very hard	1	906	32	16·94	13·6	12·9	80·5
do	Black prairie loam	Wheat 8 years	1	509	18		14·7	14	
do	do	Beets cultivated once	1	849	30	17·70	14·5	13·8	81·9
do	Prairie land		1	722	25·5	16·51	12·8	12·2	77·7
do	Black volcanic soil	No cultivation	1	156	5·5		13	12·4	
do	Prairie land		1	396	14	16·54	12·6	12	76·4
do	Rolling prairie land.		1	184	6·5		16·4	15·6	
do	Bunch grass land	Cultivated once	1	255	9		15·2	14·4	
do	Prairie land	In wheat 6 years	1	396	14		15·1	14·3	
do	Loose prairie land	No cultivation	1	1,571	55·5	16·16	12	11·4	74
do	Prairie land	In wheat 12 years	1	651	23	17·48	13·7	13	78·2
do	Deep black loam	Beets grew slowly	1	170	6		16·3	15·5	
do	do	Cultivated once; ground hard.	1	198	7		16·6	15·8	
do	Bunch grass land	No cultivation	1	310	11		14·6	13·9	
do	Black volcanic loam	do	1	449	15·5	16·46	14·8	14·1	89·7
do	Rolling prairie land	do	1	310	11		12·6	12	
Oct. 10	Black loam, volcanic	No fertilizer	1	1,259	44·5	15·17	10	9·5	65·8
do	Prairie land	Wheat for 5 years	1	1,090	38·5	13·57	9·4	8·9	69·1
do	Black volcanic soil		1	863	30·5	13·97	9·8	9·3	70
do	Black prairie loam		1	1,401	49·5	13·67	8·5	8·1	62·1
do	Loose prairie land	Cultivated twice	1	538	19	14·07	8	7·6	56·7
do	Black prairie loam		1	736	26	15·07	11	10·5	72·8
do	do		1	835	29·5	14·97	11·3	10·7	75·4
do	Prairie land	Not subsoiled	1	920	32·5	16·47	11·6	11	70·3
do	Black clay loam	No fertilizer	1	736	26	16·27	11·5	10·9	70·5
do	Prairie land		1	552	19·5	13·47	9·6	9·1	71·1
do	do		1	821	29	15·17	11·9	11·3	78·3
do	Black volcanic loam		1	1,090	38·5	15·47	10·7	10·2	69
do	Mellow prairie soil	Cultivated 3 times	1	538	19	16·67	12·4	11·8	74·3
do	Prairie loam		1	722	25·5	16·37	11·4	10·8	69·5
do	Fine prairie land		1	651	23	15·77	10·6	10·1	67·1
do	Volcanic loam		1	467	16·5	16·97	13·4	12·7	78·8
do	Black loam, clay subsoil.		1	368	13	19·27	13·3	12·6	68·9
do	Black loam	In wheat 5 years	1	495	17·5	18·77	15·4	14·6	81·9
do	do		1	580	20·5	14·27	10·3	9·8	72
Sept. 18	Black prairie soil	No fertilizer				20·58	13·5	12·8	65·6
Oct. 15	do		2	764	27	17·49	13·1	12·4	74·8
do	Yellow prairie loam	No fertilizer	2	538	19	18·29	14·8	14·1	80·8
do	Black prairie soil	do	2	708	25	18·59	14·5	13·8	78
do	do	do	2	807	28·5	17·87	13·4	12·7	74·9
do	Black bottom land	do	2	884	31	16·98	13·4	12·7	78·8
do	Yellow prairie loam	do	2	779	27·5	17·87	14·5	13·8	81·1
do	Black prairie soil		2	729	25·5	18·08	14·3	13·6	78·9
do	Yellow prairie loam	No fertilizer	2	820	29	16·79	13·2	12·5	78·5
do	Black prairie soil	do	2	580	20·5	18·98	15·9	15·1	83·6
Oct. 6	Black prairie loam	do	2	2,030	72	14·86	9·3	8·9	62·4
Oct. 1	Black soil		1	778	27·5	20·56	15·9	15·1	77·1
do	Black loam		1	1,160	41	14·56	8·3	7·9	56·9
Oct. 6	Black mould, yellow clay subsoil.		2	1,479	52	14·87	10·2	9·7	68·4
Nov. 5	Side hill			1,010	35·6		12	11·4	67
				1,122	46·5		13·7	13	72·1
				1,180	41·5		12·2	11·6	68·3
Nov. 16	Black soil			827	29		14·6	13·9	76·8
				785	27·5		14·7	14	81·2
				630	22		13·7	13	75·3
				850	30		12·9	12·3	79
Nov. 8		Sod turned in April.		990	35		14·5	13·8	78·4

Table of analyses of beets grown in different parts of the United

WASHINGTON—Continued.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
17321	D. W. Tweitmeyer	Palouse	Whitman		May 20
17326	H. M. Haskel, by H. W. Lichty & Co.	...do	...do		1st week in June.
60	J. M. Stout	Yakima	Yakima	Kleinwanzlebener	Apr. 26
160	...do	...do	...do	...do	...do

WYOMING.

Serial No.	Name of grower.	Post-office.	County.	Variety.	Time of planting.
56	F. J. Niswander	Laramie	Albany	Vilmorin's La plus Riche.	May 13
57	...do	...do	...do	Knauer	...do
58	...do	...do	...do	Dippe's Kleinwanzlebener.	...do
17251	Alfred Bridger	Sibylee	...do	Vilmorin's Richest	June 2
33	J. D. Parker	Saratoga	Carbon	Kleinwanzlebener Imperial.	May 10
35	...do	...do	...do	Improved Bulteau	...do
63	...do	...do	...do	Vilmorin's Richest	June 3
64	...do	...do	...do	Improve dKleinwanzlebener.	May 9
17255	...do	...do	...do	Vilmorin's Richest	
17256	...do	...do	...do	Improved Bulteau-Desprez.	
47	Sundance Expt. Farm	Sundance	Crook	Dippe's Kleinwanzlebener.	May 18
48	...do	...do	...do	Vilmorin's Richest	...do
49	...do	...do	...do	Kleinwanzlebener	...do
50	...do	...do	...do	Improved Bulteau-Desprez.	...do
186	...do	...do	...do	Vilmorin's Richest	May 17
187	...do	...do	...do	Improved Bulteau-Desprez.	...do
188	...do	...do	...do	Improved Kleinwanzlebener.	May 18
189	...do	...do	...do	Dippe's Kleinwanzlebener.	May 17
100	J. S. Meyer (Lander Experiment Station).	Lander	Fremont	Vilmorin's Richest	May 5
101	...do	...do	...do	Knauer's Imperial	...do
102	...do	...do	...do	Dippe's Kleinwanzlebener.	...do
159	...do	...do	...do	Improved Bulteau	May 10
17249	...do	...do	...do	...do	...do
39	M. R. Johnson	Whiteland	Laramie	Vilmorin's Richest	May 8
40	...do	...do	...do	Knauer's Imperial	...do
17312	...do	...do	...do	Kleinwanzlebener	Apr. 24
17315	...do	...do	...do	Bulteau	Apr. 25
17316	...do	...do	...do	Vilmorin's Richest	...do
2	John F. Lewis	Sheridan	Sheridan	Improved Bulteau	May 8
4	...do	...do	...do	Desprez	...do
5	...do	...do	...do	Kleinwanzlebener	...do
9	...do	...do	...do	Desprez Bulteau	...do
10	...do	...do	...do	Kleinwanzlebener	...do
127	John Astle	Afton	Uinta	Desprez No. 2	May 20
16750	Mark Manley	Mountain View	...do	Kleinwanzlebener	May 10

States from seed distributed by the Department—Continued.

WASHINGTON—Continued.

Time of harvesting.	Character of soil.	Remarks by growers.	No. of beets.	Average weight.		Total solids.	Sucrose in—		Purity.
							Juice.	Beets.	
				Grams.	*Oz.*		*Per ct.*	*Per ct.*	
Nov. 7	Black, subsoil clay..	....	....	1.254	44	....	13·4	12·7	77·5
1st week in Nov.	Black loam	....	....	1.126	39·5	....	14·1	13·4	73·8
Oct. 2	Gray sandy loam, some alkali.	No fertilizer	1	877	31	20·08	17·8	16·9	88·5
Oct. 13	Gray sandy loam, considerable alkali.	....	2	524	18·5	17·50	15·8	15	90·2

WYOMING.

Oct. 3	Gravel loam	Irrigated by furrow irrigation.	....	....	....	17·52	13·8	13·1	78·8
...do	....do	....do	....	....	....	16·96	12·9	12·3	75·9
...do	....do	....do	....	....	....	17·36	13·2	12·5	75·9
Oct. 12	....	....	....	530	19	....	16·6	15·7	7[illegible]·1
Sept. 25	Light sandy clay ...	Irrigated 3 times	....	....	....	20·60	16·8	16	81·5
...do	....do	Flooded 3 times.......	....	....	....	21·10	17·7	16·8	83·9
Oct. 6	....do	Irrigated 3 times......	1	1,344	47·5	18·64	15·8	15	85
...do	....do	....do	1	1,330	47	19·68	16·7	15·9	84·8
Oct. 16	Sandy loam	In culture 3 years; irrigated.	....	310	11	....	22·5	21·4	86·1
...do	....do	....do	....	347	12	....	21	20·1	82·7
Sept. 25	Decomposed reddish gypsum.	....	....	....	....	19·50	14·1	13·4	72·3
...do	....do	....	....	....	....	21·77	15·7	14·9	72
...do	....do	....	....	....	....	23·66	18	17·1	76
...do	....do	....	....	Too small for analysis.					
Oct. 14	....do	....	2	297	10·5	22·92	17·8	16·9	87·8
...do	....do	....	2	226	8	24·21	17·5	16·6	72·3
...do	....do	....	2	389	13·5	21·33	16·2	15·4	76
...do	....do	....	2	382	13·5	19·74	14·5	13·8	73·7
Oct. 3	Red sandy loam	Irrigated 3 times......	3	377	13	20·86	16·2	15·4	77·4
...do	....do	....do	3	481	17	20·26	16·4	15·6	80·9
...do	....do	....do	3	406	14	20·16	15·9	15·1	78·7
Oct. 13	Black sandy loam ..	Irrigated twice	4	810	38·5	19	15·8	15	83·1
...do	....	....	....	657	23·5	....	15·7	14·9	85·4
Sept. 25	Sandy loam..........	Irrigated 7 times; no fertilizer.	....	....	....	21·40	18·6	17·7	86·9
...do	....do	....do	....	....	....	20·90	17·8	16·9	85·1
Oct. 4	Red clay loam	....	....	293	10	....	22·3	21·2	86·4
Oct. 5	....do	Season rather dry ...	....	263	9	....	22·9	21·8	89·1
...do	....do	....	....	239	8·5	....	22·7	21·6	86·1
Aug. 8	Black loam, with clay.	Irrigated 3 times	....	....	....	17·70	13·8	13	78
Sept. 7	....do	Irrigated 4 times	....	....	....	20·74	17·9	17	86·3
...do	....do	....do	....	....	....	19·98	17·2	16·3	86·1
...do	....do	....do	....	....	....	21·94	18	17·1	82
...do	....do	....do	....	....	....	22·44	17·7	16·8	78·9
Oct. 1	Brown gravel loam.	....do	2	594	21	16·69	13·6	12·9	81·5
Oct 2	Sandy loam	....do	...	575	20	....	13·9	13·1	72·4

A LIMITED DISTRIBUTION OF HIGH-GRADE SEEDS.

It is not believed that further experiment with the promiscuous distribution of seed will be of any practical benefit. Nevertheless, there is a large number of farmers applying each year for samples of seed, and incidentally some good can be done by supplying them with what they need. It is not necessary to enter into an argument here that the farmer will not be able on his own motion to secure beet seed of high grade. He can not be sure that the sugar-beet seed offered by dealers is anything more than the seed of the common beet; he does not know the address of the growers of beet seed of established reputation; even if he did, the cost and trouble of securing 2 or 3 pounds from abroad would be so great as to deter him from making the attempt. It seems, therefore, proper that as long as the Department is engaged in the distribution of seeds, it should send to those who inquire for them small samples of the highest grade beet seed which can be produced. While most of the samples will be productive of no great good, yet now and then one may reach a locality where it will excite interest, and possibly do much toward the future development of the industry. In addition to this it must not be forgotten that the cost of sending out a few thousand packages of beet seed is very small, and the chemical analyses are secured without expending a single dollar over the usual cost of conducting the laboratory. If the farmers receiving these gifts of the Department would learn the single lesson of appreciating the scientific agriculture which has made the sugar beet possible, it would be an ample repayment of the whole cost of distribution.

RELATION OF IRRIGATION TO SUGAR-BEET CULTURE.

In former reports attention has been called to the probable practical value of irrigated lands for the production of sugar beets. The high fixed charges which must necessarily attach to all irrigated lands render it imperative that some crop should be grown capable of intensive culture and of yielding large financial returns. There is no crop which offers so many advantages of this kind as the sugar beet. The growth of potatoes or vegetables for home market, or of any crop of this kind usually produced by intensive culture, must necessarily be restricted to a limited area, but the comparatively unlimited expansiveness of the market for sugar renders it possible to devote practically all of the irrigated lands which are likely to be recovered in many years to the production of the sugar beet.

EXPERIMENTS AT GRAND JUNCTION, COLO.

An interesting report of the growth of the sugar beet on irrigated land has been received from the Mitchell Drug Company, of Grand Junction, Colo. The report is accompanied by the following letter from Mr. C. E. Mitchell:

I take the liberty to forward you the tabulated results of my experiments with sugar beets in this valley during the past season. The analyses were all made by the

Lehi-Utah Beet Sugar Factory and the three carloads sold were bought by them. The yield where any sort of care had been taken of the crop has averaged 15 tons; beets were planted in rows 24 inches apart; cost of crop loaded on car about $45 per acre. There seems to be no difference in results when crop is rightly handled, from seed sown on heavy adobe soil or in the best sandy loam. All our crops, as the weather report shows, are dependent entirely on irrigation, and absolutely under the farmer's control in this respect. I am laboring with a view to getting capital to establish a plant here. I think I have all necessary points as regards cheap fuel, lime rock, etc., fully covered, and can show conclusively how money in a plant here can be made to pay good interest on capital invested. I have a theory that having the growth of the plant under our control and the large number of clear days and even temperature we have from August 10 to November 15, we have an exceptional climate for producing a beet rich in sugar and high in purity. Shall be glad to furnish you with any information as to my work that I can, and to receive suggestions from you. The seed used was the white variety and obtained from the Lehi factory.

METEOROLOGICAL STATISTICS.

Following is a summary of the weather data in Grand Junction, Colo., during the year:

December, 1892.

	Inches.
Total precipitation, snow fall	1¼
Mean temperature	29
Clear days	8
Fair days	15
Cloudy days	8

January, 1893.

Total precipitation, snow fall	2½
Mean temperature	28·76
Clear days	22
Cloudy days	7
Fair days	2

February, 1893.

Total precipitation, snow fall	18¾
Mean temperature	32·8
Clear days	11
Fair days	7
Cloudy days	10

March, 1893.

Total precipitation, snow fall	3½
Total precipitation, rainfall	0·58
Mean temperature	41·2
Clear days	15
Cloudy days	12
Fair days	4

April, 1893.

Total precipitation	0·3
Mean temperature	51·05
Clear days	8
Cloudy days	11
Fair days	11

May, 1893.

	Inches.
Total precipitation	0·79
Mean temperature	60·8
Clear days	22
Cloudy days	2
Fair days	7

June, 1893.

Total precipitation	0·09
Mean temperature	72·3
Cloudy days	5
Clear days	24
Fair days	1

July, 1893.

Total precipitation	0·11
Mean temperature	78·3
Cloudy days	4
Clear days	22
Fair days	5

August, 1893.

Total precipitation	0·89
Mean temperature	74·3
Cloudy days	4
Fair days	8
Clear days	19

September, 1893.

Total precipitation	0·22
Mean temperature	66·2
Cloudy days	1
Clear days	29

October, 1893.

	Inches.
Total precipitation	0·8
Mean temperature	52·8
Cloudy days	2
Clear days	22
Fair days	7

November, 1893.

	Inches.
Total precipitation:	
Snow fall	5½
Rainfall	0·25
Clear days	23
Fair days	4
Cloudy days	3
Mean temperature	37·2

ANALYSES OF BEETS GROWN ON DIFFERENT SOILS.

Sugar beets were grown by the various farmers in the neighborhood of Grand Valley, and the report of the analyses of samples from each of these is given in the following table:

Results of experiments in the growth of sugar beets in Grand Valley, Colorado.

[About 50 acres were under cultivation, embracing a variety of soils.]

Name.	Planted.	First sampling.	Polar.	Purity.	Second sampling.	Polar.	Purity.
			Per cent.	Per cent.		Per cent.	Per cent.
Currie	Apr. 20	Sept. 27	12·2	73·5	Oct. 25	12·7	76·1
P. A. Rice	...do	...do	13	76·5	...do	13·6	78·6
A. A. Miller	...do	Sept. 19	10·2	72·3	...do	14·1	81·8
Indian School	Apr. 26				Oct. 19	16	84
A. J. McCune	Apr. 22	Sept. 27	10	67·1	Oct. 25	11·1	70·9
Ed Bravier	...do	...do	13·4	76·1	Oct. 19	15·7	85
C. W. Steele	Apr. 26						
Eugene Allison	Apr. 28				Oct. 25	16·5	81·3
Ovid Turnill	Apr. 29				...do	13·3	78·2
W. H. Benkit	May 3	Sept. 27	12	74·1	Nov. 4	14	78·3
Porter	...do	Oct. 12	12·8	81·3			
W. D. Spencer	May 4	Sept. 27	11·5	71·4	Oct. 31	13·8	78·5
N. Poffenberger	May 8	Sept. 19	11·6	73·5	Oct. 16	14·7	81
L. Johnson	...do	...do	9·5	67·5	Oct. 25	12·6	74
W. F. Sherwel	May 9	Sept. 27	9	67·7	...do	10·4	76·5
Joe Smith	...do				...do	14·8	83·9
John Vaugn	May 10	Sept. 27	12·4	72·1			
M. S. Hildreth	May 11				Oct. 31	12·3	77·2
F. S. Clarke	...do						
J. C. Sullivan	May 12				Oct. 31	12·3	72·2
Frank Leach	May 15	Sept. 19	12·7	76·4	Oct. 25	15	82
George Davis	May 17				Oct. 31	17·2	76·3
C. N. Cox	May 23	Sept. 27	10·4	69·3	Oct. 25	15·1	81·5
Frank Rich	...do	...do	11·6	70	...do	17	84·5
W. E. Renick	May 25	Sept. 19	12·3	77·7	Oct. 16	11·6	68·9
John Peugh	May 26	...do	11	75·3	...do	12·3	74·7
Jack O'Keefe	May 30	Sept. 27	11	78·8			
J. A. Layton	...do	...do	10·9	69·4			
Smith Bros	May 15	...do	13·4	74·9	Oct. 25	16.1	83·7
Arhnes	...do				Oct. 31	12·5	73·8

NOTE.—A. A. Miller and Ed. Bravier shipped a car November 20, which ran 16·2 per cent; 85 purity. Poffenberger and Joe Smith shipped a car November 15, which ran 15·7 per cent; 84 purity. Frank Leach shipped November 20, ran 15 per cent; 84 purity.

These results all show that if the seed were planted earlier, say about March 15, and the crop only watered sufficiently to prevent its drying up, most excellent beets would be ripe for manufacturing purposes by October 15. In every case where the last analysis has shown purity less than 80 we find that the crop was irrigated from two to three or four times, some having had water as late as August 20. None of these beets had any cultivation to speak of. One or two fields only were cultivated twice, a few had one cultivation, but most of them were not touched after thinning, and in only a few cases was the thinning done with any degree of care.

It will be observed in many cases that the analytical data show beets extremely poor for sugar-making purposes. A beet juice in which the

purity falls below 80 needs radical improvement before it can be recommended commercially for the production of sugar. In several instances of the beets examined from the fields in the Grand Valley we find a purity below 80. These soils are undoubtedly rich in alkaline substances and, therefore, could not be expected at first to give a beet with exceptionally high purity. Again, the whole relation of water furnished by irrigation to beet culture needs to be elaborated by careful experimental control, such as can not be secured under the direction of the farmer.

NEED OF EXPERIMENTS IN IRRIGATED REGIONS.

In view of the magnitude of the interests involved a recommendation for the establishment of an experimental station for beet culture in an irrigated region ought to carry great weight with Congress. In fact, it is highly desirable that the experimental results which are so necessary to the proper development of the industry should be obtained under conditions varying as widely as possible. The production of beets in a climate as fickle and capricious as that of Nebraska is well illustrated by the experimental station at Schuyler. The production of beets without irrigation and without rain in the valleys of California should also be the subject of experimental study.

For a proper study of the development of the beet-sugar industry under the varying climate of the United States, at least four experimental stations are necessary. The one in Nebraska is sufficient for the conditions which obtain in Nebraska, the two Dakotas, and to a limited extent in Iowa and Minnesota. A station in an irrigated valley would illustrate the necessary steps in the development of the industry in all of the elevated plateaus of the arid region embraced in Utah, Colorado, Nevada, Montana, New Mexico, and Arizona. A station on the Pacific coast in one of the southern coast valleys of California would serve to study the conditions there obtaining. For the large area represented by northern New York, northern Ohio, northern Indiana, northern Illinois, southern Wisconsin, and the whole of Michigan, a separate station would be necessary.

BEET-SUGAR STATISTICS.

The quantities of beet sugar made in the United States during the past few years are as follows:*

	Pounds.
1887	600,000
1888	4,000,000
1889	6,000,000
1890	8,000,000
1891	12,004,838
1892	27,083,288
1893	†43,953,264

*By courtesy of Commissioner of Internal Revenue.

†Returns to February 1, 1894—one factory still in operation.

The crop in 1893 was made in the following localities:

	Pounds.
Virginia	43,995
Grand Island, Nebr	1,835,900
Norfolk, Nebr	4,107,300
Utah	3,877,100
Alameda, Cal	4,486,572
Watsonville, Cal	15,539,040
Chino, Cal	15,063,357

There are in the United States seven beet-sugar factories, representing an investment of nearly $2,000,000. Tributary to these factories there are at least 24,000 acres of the best agricultural lands. The cost of cultivating all this land if placed in beets would be $960,000. Much of this land is, however, used for rotation, and therefore the the cost of cultivation is less.

The total number of tons of beets manufactured into sugar during the past year, in round numbers, was about 200,353. The average price paid the farmers for this material was $4.50 per ton, amounting, in round numbers to $900,000. The 44,000,000 pounds of sugar made was worth 3 cents a pound, making a total value of $1,320,000. The average bounty received was nearly 2 cents a pound, making approximately $860,000. The total amount of money received for the sugar produced was therefore, approximately, $2,180,000.

EXPERIMENTS AT SCHUYLER, NEBR.

The experiment station at Schuyler, Nebr., established for the purpose of improving the sugar beet and demonstrating the most approved methods of its cultivation, was continued during the growing season of 1893.

THE SELECTION OF "MOTHER BEETS."

During the previous autumn the different standard varieties of beets, as harvested from the experimental plats, were carefully culled for the selection of mothers. In the first selection of mother beets, as has been stated in previous reports, the general appearance of the beet only is considered. A plat of beets having been harvested, a skilled workman is assigned to the task of collecting those which seem to be especially fitted for the purpose of producing seed during the coming year. Beets are selected that are perfect in form, with long and tapering tap roots, smooth exterior, and about 1 pound in weight. These beets are collected, care being taken not to bruise them, and they are at once placed in moist earth until the time comes for siloing for the winter. The tops of these beets which are to be preserved for growing are cut in such a way as not to interfere with the buds at the neck, a part of the stem of the leaf being left on the beet.

ERRATA.

On pages 27, 29, 31, 38, and 41 read degrees F instead of degrees C.

SILOING SUGAR BEETS—RESULTS.

The siloing of the beets should not be undertaken until late in the fall when it becomes necessary to protect them from injury by frost. It is highly important that the temperature of the silo do not rise at any time above 45° C. A higher temperature than this induces growth and a consequent loss of saccharine content.

ARRANGEMENT OF THE SILOS.

The beets preserved over the winter at the station were siloed in the following way: They were placed in the silos in a diagonal position, with the tops upward, and carefully packed with moist sand. The silos were so arranged as to be easily ventilated. In the bottom of each silo, at the time the beets were placed therein, was placed a half ton of ice in large pieces, for the purpose of rapidly cooling the temperature of the silo below the growth point. The drainage of the silo was so arranged that the water from the melting ice would not touch the beets. At the closing of the silos on the 5th of November the temperature, as indicated by thermometrical observations, was 43° C.; on the 20th of December the temperature was 42° C., and on the 21st of March, the date at which the silos were opened, the temperature was 39.2° C. These observations show how uniform the temperature of the silos was kept, and at such a point as to prevent to the largest extent any evaporation from the beets or any growth thereof.

The total number of beets placed in the silos was 6,378. When the silos were opened on the 21st of March the beets were found to be in excellent condition; there had been, in point of fact, an increase of weight rather than a loss. This was determined by placing in each silo a given number of carefully weighed beets. These same beets on the opening of the silos were taken out and at once reweighed. Any change in weight would, of course, be revealed by this duplicate weighing.

INCREASED WEIGHT OF BEETS.

An illustration of the increase in weight mentioned is given by the following experiment:

The weight of ten beets siloed on the 4th of November, 1892, was 4,840 grams. The weight of this same lot of beets on the 27th of March, when they were removed from the silo, was 5,400 grams; increase 560 grams, or 11.5 per cent. This increase was due to the fact that at the time of siloing the beets they had become wilted from excessive drouth. The autumn at the station had been particularly dry, and the beets at the time of harvest were in a partly wilted state. These beets, being carefully packed in moist sand and kept at a low temperature, absorbed moisture during the winter with the increase of weight noticed. Ordinarily there would be a decrease of weight in siloed beets, but in the

present conditions the reverse was true. Of the 6,378 beets which were siloed in November, 1892, 6,370 were found in perfect condition when the silos were opened, only eight beets having been spoiled. This is a most remarkable showing and indicates the care with which the siloing was done.

ANALYSES FOR DETERMINING SUGAR CONTENT.

The mother beets, when taken from the silos, are subjected to analysis in the manner described in previous reports. Each beet, after weighing, is turned over to the analyst, who by means of a proper machine removes a cylindrical section diagonally through the beet, thus securing a sufficient quantity for analysis without in any way injuring the beet for germinating purposes. The beet pulp thus secured is subjected to pressure and the juice obtained is analyzed. Inasmuch as the average marc or fibrous portion of the beet pulp amounts to about 5 per cent, the percentage of sugar in the beet is easily calculated by multiplying the percentage found in the juice expressed by 0·95.

The beets were divided by analysis into three classes: The first class included all those beets containing not less than 12 per cent nor more than 15 per cent of sugar; the second class, those beets which contained from 15 to 18 per cent of sugar; and the third or élite class, those beets having over 18 per cent of sugar. The number of beets falling in each classification as a result of the analysis for each variety is found in the following table:

Varieties.	No. 1 grade: Sucrose 18 per cent and upwards.	No. 2 grade: Sucrose 15 to 18 per cent.	No. 3 grade: Sucrose 12 to 15 per cent.
Original Kleinwanzlebener	36	465	448
Dippe's Kleinwanzlebener	6	483	1,176
Vilmorin's Improved	8	600	784
Lemaire	0	0	476
Desprez	0	0	168
Elite Kleinwanzlebener	7	210	224
Total	56	1,758	3,276

These percentages of sugar were determined by taking the analytical data obtained and calculating therefrom the content of sugar which the beets had at the time of harvest. These data for this calculation indicated the analyses at the time of harvest, at the time of storage, and at the time of opening the silos. As a result of the analyses, 5,091 beets were accepted for the production of seed and 1,179 were rejected.

Although the conditions of storage, as indicated above, were the most favorable, yet it must not be forgotten that the vital action of the beet in the silo is not altogether destroyed, but only reduced to a certain minimum. As long as the beet is alive there must be still some action of vitality, and this can only depend upon the consumption of the store of plant food which has been accumulated in the beet itself.

Therefore, even in the favorable circumstances in which the beets were placed, and at a temperature of say 40° C., there was during the duration of the storage sufficient vital action to diminish to a certain extent the total percentage of sugar in the beets. This was determined by analysis of average samples of beets at the time of storage and at the opening of the silos.

Making correction for the increase in weight due to the absorption of moisture during the winter, it was found that the average content of sugar in the beets of all varieties at the time of storage was 12·0; the average at the time of opening the silos had been reduced to 11·6, showing a loss of 0·4 per cent of sugar during the winter.

Some of the varieties lost more sugar than others. For instance, in Vilmorin's Improved there was apparently a gain of 0·1 per cent of sugar during the winter, while in the Desprez variety the content of sugar had not changed nor had it appreciably changed in the Elite Kleinwanzlebener variety.

At the time of the harvest of the beets on the 10th of October the average content of sugar therein was 15·1; at the time of their storage in silos it was 12, and at the time of opening in the spring it was 11·6 per cent. There had been, therefore, a total loss of sugar from the time of harvest of 3·4 per cent. This gave a total loss of sugar from the time of harvest to the time of analysis of 23 per cent; of which 20 per cent, in round numbers, occurred between the 15th of October and the 4th ot November (the time the beets were placed in silo), and 3 per cent, in round numbers, from the time they were placed in the silo until their analysis in the latter part of March.

THE PRODUCTION OF SEED.

After the analysis and classification of the mother beets the planting was accomplished by setting them in ground which had been properly prepared. Planting was commenced on the 28th of April and completed on the 2d of May, the different grades being carefully separated in the plats. Special care was taken in this respect in regard to the No. 1 grade (the highest grade) so that they could be sufficiently distant from all other varieties to prevent any contamination by the distribution of the pollen in the fertilization of the seed. Of the 5,091 mother beets which were planted, less than 20 failed to grow, showing a remarkable vitality.

The weather during June was abnormally dry, with a high temperature, but this dry weather did not seem to affect the growth or stand of the plant. There was also another season of dry weather during the latter part of July and the first of August, the temperature being very high caused the seed to mature somewhat early, and thus reduced the quantity of yield. The quality of the seed, however, as indicated by its brightness and weight, was most excellent.

YIELD AND QUALITY OF SEED.

The following data give an idea of the amount of seed obtained in comparison with the yield of seed during the season of 1892. In that year the area planted to mother beets was 98.3 square rods, and the weight of seed obtained 595 pounds, giving a yield per acre of 968 pounds. In 1893 the area planted to mother beets was 113 square rods, and the weight of seed obtained 610 pounds, giving a yield per acre of 863 pounds.

On account of the high quality of the seed it was sold to the Oxnard Beet Sugar Company at a price far in excess of that paid for the best imported seed. The sum received for the seed was at the rate of $172.60 per acre. In regard to the sale of the seed, reference is made exclusively to the seed of the lowest grade. The high-bred seeds of grades No. 1 and No. 2 were reserved for use in experimental work.

COST OF PRODUCING BEET SEED.

The general result of the two seasons' work in the production of seed is of the most satisfactory character. It has been shown that seed of the finest quality can be produced, and the germination of the home-grown seed has showed its high vitality. The fact that a practical beet-sugar manufacturer was willing to pay from 5 to 7 cents more for the lowest or third grade of seed than he would for the best imported seed shows in what esteem this seed was held for practical purposes. It is demonstrated that by proper care beet seed can be produced in this country on one acre of ground planted thereto of a value of at least $150. The actual cost of the production of this seed can not be inferred from the cost of its production in the small way in which it was grown. The extreme care exercised in preventing the varieties from mixing, making it necessary to plant in small plats at great distances, and the extra care and labor which such supervision required, would of course increase the cost greatly beyond that which would be incurred in the production of seed in a purely commercial way. The great point which has been demonstrated by these experiments is the fact that seed can be produced of the value of at least $150 per acre, that this seed is bright and clean and of high germinating power, and, as will be seen further on, will produce a better crop of beets for sugar-making purposes than the best imported varieties.

It remains for future experimental work to develop to the fullest extent the soil, and the climatic and cultural conditions affecting the acclimatization of the high-bred sugar beet of Europe to the conditions obtaining in this country.

EXPERIMENTS IN BEET CULTURE.

The preparation of the plats for planting was commenced in the autumn of 1892. Each plat was thoroughly plowed and subsoiled to the depth of 18 inches in October, and the surface of each plat placed

in proper tilth. The spring of 1893 found the ground in excellent condition, the surface having been thoroughly pulverized by the frost. The soil, however, in the spring was not thoroughly saturated with water, on account of the extremely dry autumn and the failure of the winter's snows to furnish sufficient moisture on melting to thoroughly saturate the undersoil. This did not apply particularly to the suface of the soil, which was moist enough, but to the water reserve below the subsoil and upon which the subsoil and the soil would be compelled to draw in case of another dry season. The preparation of the plats for planting was finished in April and the seed, both of foreign and domestic production, thoroughly tested in regard to its vitality. The planting commenced on the 10th of April and continued at intervals for six weeks.

Careful observations in regard to the germination of the seed showed that as a rule the home-grown seed appeared above ground from one to two days in advance of the corresponding imported varieties. In all cases, in order to secure proper tests, the home-grown and imported seeds were planted side by side, not only at the first but at all subsequent plantings.

On April 22 the temperature fell to 13° C., and this winter temperature put a decided check to the operations of the station and of necessity injured greatly the plantings which had been made previous thereto. By reason of this abnormally cold weather the close of April found vegetation in rather a discouraging condition. For the sake of economy only 5 acres were planted in beets in the spring of 1893, instead of 8 acres, which was the originally intended area for the proper rotation of the station crops. In spite of these discouraging circumstances, however, all the plats presented an even appearance by the beginning of June. On the 7th of June a great dust storm swept over the district. The wind came up from the southwest at 4:30 p. m., and at 5 o'clock nearly every young beet plant had been cut off close to the ground. Only one acre of the total area planted escaped total destruction, and this was so badly damaged in places that the aftergrowth was very slow, and the final crop the poorest on the station.

The most serious result of this storm, together with another one which came on the 9th of June, was the total destruction of the plants which had been started from the first or highest grade of home-grown seed. The comparative tests were therefore made with the second grade of seed instead of the highest.

All the plats injured were replanted by the 15th of June. The rate of germination of the seed planted at this period was quite in contrast with that of the earlier plantings. The plants from the home-grown seed were visible above ground in seventy-two hours, while those of the imported seed were first visible after one hundred and twenty-four hours, being a conclusive proof of the superior vitality of the home-grown seed.

The cultivation of the plats was more satisfactory than that of any previous years, because the laborers employed were the same who had been employed in former seasons and their acquaintance with the methods of beet culture was, therefore, more thorough.

The meteorological conditions for the growing season are summarized in the following table:

Observations.	May.	June.	July.	August.	September.
Temperature.	°	°	°	°	°
Means for 1893	58·4	72·2	75·0	70·7	65·1
Means for 1892	55·3	66·6	75·0	72·8	66·5
Means for 1891	59·0	68·4	69·9	70·2	65·1
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Rainfall 1893	4·27	1·64	4·69	2·61	2·03
Rainfall 1892	6·62	·50	2·50	3·36	0·28
Rainfall 1891	1·38	11·59	6·71	2·22	0·84

Fortunately the insect ravages which produced such disastrous effects on the crop of 1892 were entirely absent during the season of 1893. The cultivation of the crop and its laying-by followed in due order, and on the 4th of September the first of the analytical work in the examination of the new crop was commenced.

ANALYTICAL DATA.

As a result of the first series of examinations in the beginning of September it was found that the home-grown seed had produced a greater weight of beets per acre while they had the full equivalent of sugar content.

Compared with the crop of 1892 the data are as follows:

The mean weight of all varieties of beets in 1892, in the beginning of September, was 279 grams, and the sugar content 10·6 per cent. At the same season in 1893 the mean weight of the beets was 389 grams and the mean sugar content 11·6 per cent. It is thus seen that in both the weight of the beet and the content of sugar the crop of 1893 at this season was superior to that of 1892.

On September 28, as determined by experiment, the mean weight of all home-grown varieties per acre was 13·5 tons, containing 15·8 per cent of sugar, or 4,266 pounds per acre. The mean weight of the imported varieties per acre was 13·3 tons, containing 15 per cent of sugar, or 3,990 pounds per acre.

The data given above were obtained upon beets planted during April and May. It may be of interest to compare these data with those obtained from beets planted later. The beets on which the following observations were made were planted on the 12th of June, and on the ground where the previous early planting had been destroyed by the windstorms. This planting, as has already been mentioned, germinated in an unusually short time, and the subsequent growth was rapid and uninterrupted. As perfect cultivation as possible was given to

the crop, and the surface of the soil was kept in good tilth during the entire growing season. On the first of September the plats presented a splendid appearance, although the beets were far from mature. After the first of September the extremely hot and dry weather began to affect the late-planted beets, and it was observed that they were ceasing to increase in weight. Small plats were subjected to irrigation in order to determine whether any difference would be observed between the irrigated and non-irrigated beets. At the time of the harvest of the beets, a month later, it was observed that the surface irrigation had not penetrated to a depth of more than 6 inches, and below that depth the soil was dry and hard.

The late-planted plats were examined analytically only once, and as each variety did not contain more than a few hundred beets, most of which it was desirable to keep for seed, it was not thought wise to take a large number for examination, nor to repeat the analytical work. A time for analysis was therefore selected when it was supposed the beets had approximately reached their maximum of value in weight and sugar content. The results obtained for the different varieties were extremely flattering. The highest sugar content was found with the Elite Kleinwanzlebener, namely, 16·4 per cent, with a purity of 81·5, and all the other varieties approximated closely these figures, except in one instance. The varieties were all grown from domestic seed produced upon the station. The weight of the beets, however, was rather low, being only about two-thirds of the normal weight of a perfect sugar beet, showing that the excessively dry weather of September had prevented them from attaining full growth. The weight per acre and the sugar per acre of each of the late-planted plats are given in the following table:

Table showing yield per acre of sugar derived from different varieties of beets.

Varieties.	Seed.	Date.	Weight per square rod.	Yield per acre.	Sucrose.	Sugar per acre.
			Pounds.	*Tons.*	*Per cent.*	*Pounds.*
Elite Kleinwanzlebener	H	Sept. 28	172	13·7	16·4	4,513
Vilmorin's Improved	H	...do....	150	12·0	16·3	3,912
Dippe's Kleinwanzlebener	H	...do....	161	12·8	15·4	3,967
Lemaire	H	...do....	178	14·2	15·3	4,348
Knauer	H	...do....	190	15·2	16·3	4,955
Desprez	H	...do....	178	14·2	15·2	4,316
Original Kleinwanzlebener	I	...do....	143	11·4	16·0	3,661
Lemaire	I	...do....	190	15·2	14·0	4,620
Means of varieties from home-grown seed				13·5	15·8	4,266
Means of varieties from imported seed				13·3	15·0	3,990

Two of these experiments were also duplicated with imported seed, namely, those marked "I" in the table above. The low yield per acre was without doubt due to the severe drought.

There was an appreciable increase in the yield per acre of the irrigated plats without any appreciable decrease in the content of sugar.

The mean yield per acre of the irrigated beets was 16·2 tons; the mean percentage of sugar in the beets, 15·3 per cent, and the mean yield of sugar per acre, 4,954 pounds. The irrigation, therefore, had increased the yield of sugar per acre, in round numbers, 700 pounds.

THE GROWTH OF BEETS AT DIFFERENT ALTITUDES.

A series of experiments was also made in connection with the work at the station in growing beets on the bottom lands of the Platte River. Heretofore it has been considered impracticable to grow beets on this soil, subject as it is to overflow in the spring and being of an extremely sandy nature. The level of the surface of this soil is very little above that of the river, so the water line through the greater part of the year is very near the surface of the soil. These lands, of course, would be expected to produce a good showing only during an excessively dry year, as during the season of 1893. The spring of 1893 being immoderately dry, allowed the lowlands to be worked and beets to be planted early in May. The germination was rapid, and the beets grew without hindrance up to the time of maturity. On September 23 the beets were analyzed, and at the same time a similar number of beets grown by the same farmer, in the same manner and from the same seed, but upon dry soil lying higher. The comparison of the two harvests is shown by the following data: Grown on the lowland—Mean weight of beets, 523 grams; mean percentage of sugar, 13·5; mean purity, 82·8. Grown on the dry upland—Mean weight of beets, 381 grams; mean percentage of sugar, 11; mean purity, 68·3. In this instance it is seen that the difference is wholly in favor of the beets grown upon the lowlands. The uncertainty of the possibility of the cultivation of these lands, however, in the spring makes this experiment only a matter of interest in showing the necessity for a moderate supply of moisture during the growing season.

The table-lands of Nebraska are not capable of supplying a definite amount of moisture from the subsoil to a growing crop, especially to one which requires so much water for its nourishment as the sugar beet. In this respect they are quite different from the lands of the Chino Valley, California, in which crops of beets are often grown, receiving their water solely from subterranean sources. The practical lesson learned from this experiment does not indicate the continuous availability of the bottom lands of the Platte for beet-growing, but the necessity of a deeper and more thorough working of the subsoils of the uplands in order to increase the store and availability of the capillary water of the soil. Nevertheless, in this connection it may be well to speak of the fact that the Standard Cattle-Feeding Company, of Ames, Nebr., planted during the last year about 500 acres of beets on what is practically bottom lands. The yield obtained per acre was quite satisfactory and the content of sugar was also high. I regret that the officers of the company are not willing to have the data published in detail, but I am permitted to say that the results of the experiment were satisfactory both from

an agricultural point of view and financially, the beets having been delivered to a factory and a fair profit realized from them.

UNFAVORABLE CLIMATIC CONDITIONS OF NEBRASKA.

The climatic conditions that have attended the three years' experiments which have been conducted at Schuyler lead to the conclusion that the climate of Nebraska, in respect to its variations in temperature and rainfall, is not well suited to production of uniform crops of sugar beets. The variations in temperature are phenomenal; even during the summer very cold and very hot days may succeed each other in quick succession. The variations in rainfall are no less marked. At one time of the year excessive precipitation is likely to occur, followed naturally by excessive drought. All of these excesses of climate are without doubt injurious to the growth of a plant which has been developed under such even conditions as have characterized the growth of the sugar beet in Europe during the past seventy-five years. The plain deduction from these data is that the sugar beet, especially in such a climate as that of Nebraska, will undergo some changes, due to the effect of its environment, to accommodate itself to such changed conditions. Even after only two years of growth in the conditions there obtaining the domestic beet shows undoubted marks of superiority.

One encouraging feature of the problem is found in the fact that in spite of these great variations in temperature and precipitation, and chiefly with imported seeds for the production of the plants, we have been able to grow in three seasons, differing very widely in climatic conditions, crops of beets fairly satisfactory in both yield per acre and sugar content. This result shows that with the highest skill in agriculture and proper acclimatization a country, even with such a variable climate as Nebraska, may be made in one sense practically independent of these excesses of seasonal changes.

SPECIAL EXPERIMENTS IN SUGAR ELABORATION.

In addition to the general experiments which have been outlined above a number of special experiments in the production of sugar beets was also carried on at the Schuyler Station, as has been the custom in previous years. These experiments will be found fully described in the report of Mr. Maxwell, which follows. Attention will be called to only one of them here.

The interesting observations noted by Mr. Maxwell, the assistant in charge, in regard to the function of moisture in the storage of beets will be found in detail in his report. The results of these experiments are convincing to Mr. Maxwell of the formation of an additional quantity of sugar in the beets after storage. The special report justly calls attention to the fact that this conviction is in opposition to the accepted theories in regard to this matter. It is not desired, therefore, to cite these experiments for the purpose of committing the Department to any definite statement in regard to this question. The whole science of

vegetable physiology and chemistry teaches that sugar is elaborated in the leaves of the beet plant by the condensation of formyl aldehyd, which is produced by the action of the chlorophyl cell upon carbon dioxid and water. The beet itself has always been regarded simply as a store-house in which the elaborated sugar is conserved for the future use of the plant.

It is not at all impossible that sugar elaboration may go on in the cellular substance of the beet itself, although such an assumption is contrary to the generally accepted theories of vegetable chemistry. The experiments are so few in number that judgment must be reserved in regard to the matter until they may be repeated under varying conditions. In such cases the final determination of the question can not be made upon an analysis of the expressed juice alone, but must be determined by the estimation of the quantity of sugar in the beet itself without expression. In other words, the relation of the marc or pulp of the beet to the question under consideration must also be taken into account as well as the content of sugar in the juice alone.

It seems improbable in the present light of vegetable physiological chemistry to suppose there is any elaboration of sugar in such circumstances. The fact of the increase in the purity of the juice would lead to a supposition, however, that some of the materials already present in the juice are converted in some way into sucrose. That any formation of sucrose in the beet itself during storage in moisture can be secured by the condensation of carbon dioxid and water is beyond the just expectation of the accomplishments of physiological vegetable action.

GENERAL CONSIDERATIONS.

So many letters are addressed to the Department of Agriculture making inquiry in regard to the prospects of the beet-sugar industry in the United States that it seems proper to say a few words here on this subject.

The cultivation of the sugar beet is a style of agriculture so strange to American farmers as to require specific instruction and experience in order to successfully accomplish it. For this reason it is not difficult to foresee that any attempt by American farmers to plunge at once into extensive beet culture until they have learned its principles and practice must end disastrously. The great obstacle to the spread of the beet-sugar industry in the United States is without doubt an agricultural one. The experiments which have been conducted by the Department at Schuyler and the results of an immense amount of work done at the various agricultural experiment stations in the different States, together with the practical work accomplished by the seven active beet-sugar factories in the United States, have demonstrated beyond any possible doubt the fact that beets of a reasonably high sugar content can be produced over wide areas and in quantities approximating those produced in the beet fields of Europe.

In so far as the manufacturing is concerned the conditions are practically identical, although it must be admitted that in some parts of the country the conditions are more favorable and in others less favorable than in Europe. As an instance of more favorable conditions the experience of California may be cited. On account of the mild winters in that locality it is not found necessary in any case to silo the beets, and unless exposed to the danger of second growth they can be allowed to remain in the ground until the time for manufacture arrives. There is thus a considerable diminution of the expense of manufacture—an expense which comes from the labor of harvesting and siloing the beets and protecting them from frost.

On the other hand, the conditions in Nebraska are distinctly less favorable for manufacture than in Europe. In the climate of the former the access of winter is often sudden and early. It is not unusual for the thermometer to reach the zero point in November. It therefore becomes absolutely necessary that the harvest of the beets should be fully accomplished perhaps not later than the 20th or 25th of October. The whole excess of beets not manufactured at that time must therefore be preserved, and this preservation is an expensive operation in a climate where so severe a degree of frost must be expected. Then, again, the periods of cold may be separated by periods of great warmth. In this case another danger arises; the high temperature which the silos may attain at that time induces growth, or, if the buds making the growth possible are all removed, at least deterioration. Taking all parts of the country together it may be said that the conditions of manufacture, including the abundance of fuel and its cheapness and the other factors active in determining the cost of production, are as favorable as in Europe. There is one exception to this, of course, and that is in the matter of labor, the cost of which in this country is double, sometimes triple, that paid in Europe for similar service.

During the past year nearly 45,000,000 pounds of beet sugar have been produced in the United States.

REPORT OF ASSISTANT IN CHARGE.

The details of the experimental work at the Schuyler Station are contained in the report of Dr. Walter Maxwell, assistant in charge, which is as follows:

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., December 20, 1893.

SIR: I beg to submit to you the third annual report of the work of the U. S. Department of Agriculture sugar beet experiment station at Schuyler, Nebr., for the year 1893.

Very respectfully,

WALTER MAXWELL,
Assistant in Charge.

Prof. H. W. WILEY,
Director of Station.

The sugar beet experiment station commenced the work of the season of 1893 in the first week of March, the farm foreman, George Selzer, opening up the laboratory on the 2d day of the month. Preparations were made in the laboratory for conducting the analysis of the "mother beets." The abnormal and continuous low temperature, however, prevented the silos being opened until March 21, on which date the chemical work began.

METHOD OF STORING BEETS.

The mode of storing the mother beets in November, 1892, was varied from the method described in full detail in my report of last year only by the circumstance that at the time of closing the silos fully one-half ton of ice was placed in each silo for the purpose of lowering the temperature. The ice was placed in such a way that it was not in immediate contact with the beets, and in order that the water should run directly into the ventilating channel underlying the floor of the silo.

Upon inspection, the beets were found in a condition in every particular satisfactory. No visible growth had transpired, and the flesh of the roots was apparently more solid than it was at the time of storing.

EFFECT OF STORAGE ON WEIGHT OF BEETS.

In order that the character of the preservation, with respect to the loss or increase of weight by heating and evaporation, could be gauged, and likewise for the purpose of fixing the standard, which is based upon the water content, for determining the proportion of loss in sucrose, a given number of beets was washed, dried, and weighed and placed in an average position in the silos at the time of storing, and on reopening, those beets were washed and reweighed immediately. The effect of storage upon the weight of the roots is shown in the following table:

	Grams.
Weight of 10 selected beets March 27, 1893	5,400
Weight of 10 selected beets November 4, 1892	4,840
Increase of weight during the term of storage	560
Per cent of increase	11.5

The occasion of the great increase of weight in the beets which had taken place, as shown by the table, is found in the two following main causes: At the time of storing in the preceding autumn the beets were in an abnormally wilted condition, owing to the extreme heat and drought which prevailed previous to their removal from the soil. The roots thus, at the period of entering the silos, contained less than the normal amount of water, and being interlaid by layers of cold, moist sand, as described in the last year's report, the moisture equivalent was regained. Further, the placing of ice in the silos at the time of closing lowered the temperature, and reduced the possible measure of evaporation, which is shown by the thermometrical readings in the following table:

	Degrees C.
Temperature of the silos November 5	43
Temperature of the silos December 20	42
Temperature beet juices March 21	39·2

Not only could no evaporation take place with the silos maintained at such a low temperature, and the beets packed in moist sand, but the reason is likewise furnished why no growth had begun. At the degree of temperature which the juices gave on the opening day of the analytical work (39·2°) sprouting could not occur. During the winter of 1891, no change had taken place in the weight of the beets, but a notable growth had occurred, which was due to a higher temperature prevailing during the term of storage in the silos, and also to the circumstance that the opening of the silos did not take place until three weeks later in the following spring. The effect of storage upon the sugar content will be seen from the tables of analytical data.

CHEMICAL ANALYSES.

As already stated, the chemical work began on March 21, and was concluded April 8; 6,370 beets being analyzed, against 4,740 analyzed in the spring of 1892. The number of beets contained in the silos was 6,378, showing that only 8 beets in the total number stored had suffered decay.

The classification of the beets was based upon the analyses, the sugar content resolving the individuals of each variety into the grades of quality shown in the following table:

Variety.	No. I grade (sucrose 18 per cent upwards).	No. II grade (sucrose 15 to 18 per cent).	No. III grade (sucrose 12 to 15 per cent).
	Beets.	*Beets.*	*Beets.*
Original Kleinwanzlebener	36	465	448
Dippe's Kleinwanzlebener	6	483	1,176
Vilmorins' Improved	8	600	784
Lemaire	....	....	476
Desprez	....	....	168
Elite Kleinwanzlebener	7	210	224
	57	1,758	3,276

The following statement gives the proportion of the beets analyzed which was eligible for propagation uses:

Number of beets of all grades accepted for seed production	5,091
Number of beets of all grades rejected for seed production	1,179
Total	6,370

EFFECT OF STORAGE ON SUGAR CONTENT.

The effect of storage upon the sugar content is observed by comparing the relative proportions of sucrose found in the average samples of each variety at the time of siloing and when the beets were taken out for analysis. The increase of weight in the beets, which it has been shown had taken place during the term of storage, has to be included in the consideration, and the 11·5 per cent, which was the precise ratio of the increment, must be added to the sucrose readings in order that the comparison between the autumn and spring readings may be exact and the actual loss of sugar determined.

The following statement furnishes the sucrose readings of each variety, as recorded in November, 1892, and the spring readings of the varieties, plus the equivalent of the weight increment:

Varieties.	Sucrose Nov. 4.	Sucrose Mar. 21.
	Per cent.	*Per cent.*
Original Kleinwanzlebener	13·1	12·8
Dippe's Kleinwanzlebener	13·5	12·0
Vilmorin's Improved	11·4	11·5
Lemaire	10·4	10·0
Desprez	10·8	10·8
Elite Kleinwanzlebener	12·6	12·5
Means	12·9	11·6

From the table it is seen that nearly one-half of 1 per cent is the difference between the sugar content of the siloed beets in the autumn and in the following spring.

Those beets, however, at the time of their removal from the soil on and about October 10, 1892, contained 15·1 per cent of sucrose; so that during the total inter-

val of time between their removal from the soil in the previous autumn and the date of analysis in the spring, the polariscope readings had fallen 3·5 per cent, which gives a mean loss in the total sugar of all the varieties of 23·1 per cent; 19·9 per cent of which occurred between October 15 and November 4, and 3·2 per cent during the time that the beets were closed up in the silos from November 5 to March 21.

It is seen from the table that the varieties did not pass through the term of winter storage with equal advantage. This feature of the results requires further investigation, both with respect to its accuracy and to the cause, if it is found to be accurate. The matter of the loss of sugar which transpired in the autumn, and before the beets were placed in silo, is fully discussed in my report for 1892. The loss, however, of only 3·2 per cent of the total sugar during the term of storage, the almost complete immunity from decay, and the solid condition of the beets when taken out of the silos, justify the conclusion that the mode of preservation in use is in all respects satisfactory.

PLANTING MOTHER BEETS.

The planting of the mother beets was done between the dates April 28 and May 2. The method of the previous year was departed from in two respects: The No. 3 grade beets of all varieties were planted on the same plat; the No. 2 grade were placed at extreme points of distance on the station, whilst the No. 1 grade, or "Extra Quality," were planted in selected spots 1 mile distant from each other and from the station. The station was enabled to observe this great care in placing the varieties of No. 1 grade a great distance from each other through the courtesy of Messrs. Wells & Nieman, upon whose ranch two varieties were planted, and of Mr. Fuller, of the Maxwellian Ranch, whose interest in the work caused him to offer any part of his land, and likewise an excellent plat in his private garden, for the purpose.

The planting was done in every way satisfactorily, and the beets very soon exhibited their great vitality. Of the 5,091 beets planted less than 20 failed to grow; and notwithstanding the dry weather, with high temperature, which prevailed during the month of June, which is normally moist and growing, the growth was not affected, the "stand" of each plat reaching an excellent development.

The high temperature of the latter part of July and of the first days of August, during which time practically no rain fell, caused the seed to mature prematurely, and reduced the bulk of the yield, certain "stands" actually drying out, whilst the seed generally did not attain its possible size. The quality, however, as indicated by the brightness of the seed and the weight, was excellent. Had rain fallen in moderate proportion during the early part of the maturing season the yield per acre would probably have been greater by 30 per cent. The seed was all collected by August 31.

YIELD OF SEED—VALUE.

The following data give the actual seed obtained in comparison with the yield of 1892:

Season.	Varieties.	Area.	Weight of seed.	Yield per acre.
		Rods.	*Pounds.*	*Pounds.*
1893	Seed of all varieties	113·0	610	863
1892	......do	98·3	595	968

The yield per acre is a little lower this season than in 1892.

Arrangements were made with the president of the Oxnard Beet Sugar Company for the purchase of the seed at the sum of 20 cents per pound, which gave the seed crop a value of $172.60 per acre.

The seed of all varieties of the No. I and No. II grades has been retained, however, in order that it may be available should the work of the station be resumed in the spring of 1894.

CULTURAL SEASON OF THE BEET CROP.

The work of preparing the ground for the beet crop of this year was begun in the autumn of 1892. All surface cleaning was done in August; deep plowing and subsoiling, as described in my previous reports, were completed in October, and the so-called heavy and preparatory cultivation accomplished before the frosts of the late autumn came on.

In the spring the ground was in excellent condition; the frost having thoroughly pulverized the soil of the plats plowed in the preceding fall. One feature, however, was not satisfactory, which was the water reserve of the soil. The preceding summer had been dry and hot, and the rainfall common to the month of October was extremely small, consequently the water reserve of the soil at the beginning of winter was at the minimum, which was not remedied during the winter months. It was thus apparent that if another hot and dry summer should follow, with the water reserve of the soil so low in the spring, the results of the drouth would be increasedly disastrous. It will be seen later that these results were realized.

The preparation of the plats for early planting was begun on April 9, and on the following day one acre of beets was planted, the seed bed being a mass of fine, moist earth in good tilth, and the soil temperature reading 55° C.

All the seed was tested and the vitality proved by germination which was conducted in boxes in the laboratory. The following table shows the germinating power of each lot of seed planted, and the vitality of the "home-grown" seed in comparison with "imported" of the same varieties.

Planted May 23—100 seeds.	May—			June—						
Number of plantlets visible on	29	30	31	1	2	3	4	5	6	7
Vilmorin Improved (home-grown)	8	50	89	94	95	97	97	97	97	97
Dippe's Kleinwanzlebener (home-grown)	1	22	62	78	82	85	87	88	90	91
(imported)	....	7	27	53	66	75	78	80	85	87
Elite Kleinwanzlebener (home-grown)	1	30	61	71	76	80	82	83	84	89
(imported)	....	4	23	44	56	60	67	69	76	78
Knauer (home-grown)	13	59	81	85	87	87	87	87	87	88
(imported)	2	21	51	71	78	83	83	85	86	87
Lemaire (home-grown)	13	55	83	85	87	87	87	87	87	87
(imported)	9	48	83	90	96	96	96	96	97	97
Desprez (home-grown)	8	47	79	85	90	92	93	94	95	95
Mette's Specialität (imported)	....	12	35	58	77	79	82	84	87	88
Mette's Rosa Elite (imported)	....	21	50	71	75	77	77	77	77	78
Demesmay (imported)	2	4	19	44	57	63	66	69	69	69

The notable feature of the germination tests is the uniformly high germinating power of the home-grown varieties and the rapidity with which the plantlets appeared above the ground. It is seen that the native seed is from one to two days in advance of the imported of corresponding varieties in breaking the surface of the soil. An exception occurs among the imported in the instance of the Lemaire, but even with that variety the home-grown seed came up more rapidly, although not so high a percentage grew. The observations recorded in the above table were confirmed in the field, the home-grown seed coming up one to two days earlier than the imported, and being ready in advance for "thinning out."

On April 15 two more acres were planted. The home-grown and imported seeds of each variety were planted side by side, all conditions being equal. By this mode of planting the results would be comparative, and the value of the home-grown seed exactly tested.

On April 22 the minimum thermometer registered 13°, a phenomenally low temperature for that season. With the low temperature, strong winds prevailed, the latter

continuing after the temperature rose. At the close of April the aspect of vegetation generally was very discouraging.

Only 5 acres were planted in beets instead of 8 acres, as in former years, the extent allowed to each variety being lessened. Under instructions, the cultivation and expenditures were reduced to the lowest scale compatible with the purpose of efficiently conducting the experiments.

Damage by dust storms.

All the plats which had been planted presented a perfect appearance at the beginning of June. On June 7 a terrible dust storm swept over the district. The wind came up from the southeast at 4.30 p. m., and at 5 o'clock nearly every young beet plant had been cut off close to the ground. The prospect was bad. The damage wrought by the storm was of wide extent, hundreds of acres of excellent stands of beets being utterly destroyed in the beet districts of Norfolk and Grand Island.

When the storm had passed by only 1 acre of beets remained which presented any kind of appearance. This plat was left standing; the plants, however, were so fatally damaged in places that the after-growth was very slow, and the final crop the poorest on the station. It is advisable where the plants are damaged by such storms to plow up the ground and replant, the results will more than compensate the expense of extra cultivation.

On June 9, a second storm occurred which cut off certain other small experiments conducted with the "extra quality" home-grown seed. The whole of the plants from the No. 1 grade seed was lost, and the comparative tests were confined to plantings of No. 2 grade, home-grown, with seed of the same varieties imported direct from France and Germany.

On June 15, only 3 acres of beets were in progress of growth. The last acre was replanted upon the plat where the storm had destroyed the planting of an earlier date. This acre was planted with 6 varieties of home-grown and 2 varieties of imported seed. The rate of germination was extraordinary. The plantlets of the home-grown seed were visible in the row seventy-two hours after planting, which is probably the shortest time on record required by the beet seed to develop into appearance above the ground. The imported seed planted at the same time was visible in the rows after one hundred and twenty-four hours, or two days later. This is the most conclusive example of the greater vitality and germinating power of the native seed.

In speaking of the disaster caused by the dust storm, it may be noted that the lands which were lying with very compact and fine surfaces, caused by sudden rains or rolling, were most subject to the action of the wind. Lands which had been recently worked, and were not so flat, did not "blow," or extremely little, and the small clods protected the beet plants. As a provision against such storms, it thus appears advisable to pass the cultivator along the rows as soon as the plants appear, even if no weeds have come up, if only to protect the plant against that danger.

On very light sand soils nothing will avail against the winds, but on such lands beets should not be planted, and for other well-known reasons in addition to the danger of blowing.

Native and imported plants compared.

The thinning out of the plants was done satisfactorily, the laborers being those who were trained to the work in the two previous seasons. On the early planted plat the beets were placed 8 inches apart in the row; in the next plat, or May planting, 9 inches were left between the plats, while on the plat planted on June 12 the plants were set 1 foot apart, the distance between the rows, on all plats, being uniformly 18 inches.

Following the thinning out, hand-hoeing and cultivation with the horsehoe were continued until the plants were too large to be further worked without damage. The early planted plats were laid by about July 12, but work was continued in the

latest plat until July 28, when all work among the plants ceased. At this time the prospect was excellent. All the varieties made a good appearance, yet the greater vitality and rapidity of growth shown by the home-grown seed in the stage of germination was still maintained. The plants from the native seed produced a more abundant foliage system and the roots were apparently correspondingly better developed than were those from the imported seed of the same varieties. The question of the most vital interest at that period was, Will the greater promise of the product from the home-grown seed be maintained to the end?

Influence of climatic conditions.

From the time of laying by the crop to the time of maturity the matter is wholly in the hands of the climatic conditions. At the beginning of the season I observed that should even a moderately dry season occur, with the low water reserve of the ground which in the spring existed, the result would be disastrous. That condition did follow. The rainfall of June was less than one-half of the normal for the month and the weather conditions of June are almost decisive. The precipitation in July was quite insufficient to make up for the deficiency of the previous month and to resist the high temperatures of that season. The first half of August was wholly without rain and the precipitation for the month was below the normal, while with September the drought became chronic, no rain occurring in the month until the night of the 29th. And, with the small rainfall, the midsummer was characterized by very high temperatures, June and July each having a mean record of several degrees above the normal for those months.

Weather conditions.

Observations.	May.	June.	July.	August.	September.
Temperature.	°	°	°	°	°
Means for 1893	58·4	72·2	75·0	70·7	65·1
Means for 1892	55·3	66·6	75·0	72·8	66·5
Means for 1891	59·0	68·4	69·9	70·2	65·1
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Rainfall, 1893	4·27	1·64	4·69	2·61	2·03
Rainfall, 1892	6·62	0·50	2·50	3·36	0·28
Rainfall, 1891	1·38	11·59	6·71	2·22	0·84

From these data it is seen that the temperature of this season, during the most vital period, was much above the temperatures recorded in the two previous years. And the rainfall for the five months tabulated was wholly inadequate as a supplement to the low-water reserve of the ground existing at the beginning of the year. The rainfall of 1891, badly distributed though it was, was the amount of precipitation most favorable to the beet crop in Nebraska.

Happily, I have no statement to make concerning insect ravages during the closing season. A few individuals of the worm which wrought the great damage reported last year were observed in the middle of July, but the number was quite insignificant; and no second generation was observed to appear.

ANALYTICAL WORK OF THE SEASON.

On September 4 the first samples of beets were analyzed. Excepting the late-planted plats, the crop was sampled and tested, and the weight and sugar content ascertained in correspondence with the mode of control practiced in 1892.

Before giving a table of the results observed at the opening of the analytical season it must be remarked that certain early plantings of home-grown varieties of seed were wholly destroyed by the dust storm of June 8, and a comparison with the product of the imported seed of those varieties can not be made. In the later planting the comparison will be possible.

The following table represents the condition of the crop from the given varieties of home-grown and imported seed in the first week of September:

Varieties.	Seed.	Date.	Number of beets.	Mean weight of beets.	Brix.	Sucrose.	Purity.
				Grams.	*Per cent.*	*Per cent.*	*Per cent.*
Original Kleinwanzlebener	I*	Sept. 4	50	300	15·0	11·0	73.3
Vilmorin Improved	I	...do	50	275	16·1	12·5	77·6
Elite Kleinwanzlebener	H†	Sept. 5	50	396	15·4	12.0	77·9
	I	...do	50	387	15·0	10·9	72·6
Knauer	H	...do	50	521	14·8	10·6	71·6
	I	...do	50	443	15·3	10·9	71·2
Lemaire	H	Sept. 7	50	358	16·6	11·9	71·5
	I	...do	50	341	15·8	10·8	68·3
Desprez	H	...do	50	420	16·1	11·8	73·3
Mette's Specialität	I	Sept. 8	50	335	17·0	12·4	73·0
Vilmorin Improved (second planting)	I	...do	50	359	18·4	13·8	75·0
Mette's Rosa Elite	I	...do	50	391	14·8	10·2	69·0
Mean of imported seed				354		11·5	
Mean of home-grown seed				424		11·6	

*Imported. †Home-grown.

The above table shows the condition of the crop at the beginning of September. It is seen that the home-grown seed represents a greater weight of beets per acre and a full equivalent in the sugar content. It will be of interest to compare the given condition of the crop of this year with that of 1892 at the same date:

	Weight of beets.	Sucrose.
	Grams.	*Per cent.*
Mean of all varieties, 1893	389	11.6
Mean of all varieties, 1892	279	10.6

It is thus shown that the crop of this season was in a highly satisfactory condition, in comparison with the crop of 1892, in the first week of September.

As has already been stated, extreme drought prevailed during the greater part of August and through the month of September, the effects of the absence of rain being intensified by the high temperatures. It was most apparent that the beets had not only ceased to increase in weight, but that they had less weight than two weeks previously. Also, the behavior of certain of the varieties, with respect to their sugar content, was perplexing, and the indications for the results of the season far from promising. These peculiarities will be better seen from the table which represents the second analytical review of the condition of the crop:

Varieties.	Seed.	Date.	Number of beets.	Mean weight of beets.	Brix.	Sucrose.	Purity.
				Grams.	*Per cent.*	*Per cent.*	*Per cent.*
Original Kleinwanzlebener	I	Sept. 11	50	280	16·3	12·3	75·4
Vilmorin Improved	I	...do	50	299	17·0	13·2	77·6
Elite Kleinwanzlebener	H	Sept. 12	50	505	16·2	12·6	77·7
	I	...do	50	393	15·7	11·2	71·4
Knauer	H	Sept. 13	50	506	15·2	11·1	72·5
	I	...do	50	446	16·5	12·2	73·8
Lemaire	H	Sept. 14	50	372	17·0	11·8	69·0
	I	...do	50	395	17·5	11·9	68·0
Desprez	H	...do	50	391	17·4	12·6	72·0
Mette's Specialität	I	Sept. 15	50	335	17·0	12·1	71·2
Vilmorin Improved (second planting)	I	...do	50	362	18·8	14·0	74·4
Mette's Rosa Elite	I	...do	50	350	15·6	10·3	66·0

From this table it is seen that certain of the varieties gave a higher polariscope reading than in the previous week. The gain, however, was not wholly actual. A decrease in weight had occurred, caused by evaporation, under the action of the hot dry weather, and the ratio of solids in the beet had risen in proportion to the withdrawal of water.

It is observed, moreover, that, notwithstanding the decrease of weight of certain of the varieties, the per cent of sugar found in the juice was less than in the previous week. This is a phenomenon which had not been encountered in previous experimentation. Its discussion will be deferred to a later stage of the report, and in connection with specific experiments treating of the matter.

The following table records the data obtained in the third inspection of the varieties:

Varieties.	Seed.	Date.	Number of beets.	Mean weight of beets.	Brix.	Sucrose.	Purity.
				Grams.	*Per cent.*	*Per cent.*	*Per cent.*
Original Kleinwanzlebener	I	Sept. 21	50	299	18·1	13·6	75·2
Vilmorin Improved	I	...do....	50	317	17·9	13·7	76·0
Elite Kleinwanzlebener	H	Sept. 22	50	522	16·4	12·9	78·6
	I	...do....	50	407	15·7	11·1	71·2
Knauer	H	...do....	50	517	15·5	11·6	74·8
	I	...do....	50	459	16·6	12·6	75·8
Lemaire	H	Sept. 25	50	362	17·6	11·6	65·8
	I	...do....	50	333	18·1	12·6	69·6
Desprez	H	...do....	50	397	17·8	12·8	71·9
Mette's Specialität	I	...do....	50	311	17·9	12·5	69·8
Vilmorin Improved (second planting	I	...do....	50	353	18·5	13·2	71·3
Mette's Rosa Elite	I	...do....	50	329	16·5	10·2	61·8

This table shows that, comparatively, no increase in the sugar content of the beets had taken place during the interval of the week. A specific loss of sucrose is recorded in certain of the varieties and with a falling off in the bulk of the beets. The fourth weekly chemical analysis of most of the varieties will be given, which brings the report forward to the culminating period of those inimical conditions.

Variety.	Seed.	Date.	Number of beets.	Mean weight of beets.	Brix.	Sucrose.	Purity.
				Gram.	*Per cent.*	*Per cent.*	*Per cent.*
Original Kleinwanzlebener	I	Oct. 2	50	302	15·7	11·6	74·0
Vilmorin Improved	I	...do....	50	300	16·3	12·7	77·9
Lemaire	H	Oct. 3	50	387	16·2	11·6	71·6
Do	I	...do....	50	372	16·7	12·2	73·0
Desprez	H	...do....	50	397	16·7	12·5	74·8
Mette's Specialität	I	...do....	50	333	17·2	12·2	70·9
Vilmorin Improved (second planting)	I	...do....	50	352	16·9	12·1	71·6
Mette's Rosa Elite	I	...do....	50	369	15·1	9·8	65·0

Certain of the varieties were not examined in the fourth week, owing to the small number of beets remaining, many having been destroyed in June by the dust storm, and the remaining few were held back for the final review in the following week.

The loss of sugar, indicated by the table and which had occurred during one week, is appalling. Neither is there any increase in the weight of the beet which in any way can account for the loss. There is a direct disappearance of a large bulk of sugar per acre, and the cause is found in the continuance of high temperature and absence of rain. Rain fell on September 29, but that was too late; the damage was already done. The same cause acted upon the beets, although in the ground, and the same

results followed as are set forth in my experiments of last year, treating of evaporation and loss of sugar under the action of high temperature after the beets were removed from the ground. In the example under discussion, however, the beets were still in the ground, and not fully exposed to the greatest heat of the sun, and it was not to be expected that the sun's action would do more than merely dry out the beets to some degree. The drought had been of long duration, and the water reserve of the ground was extremely low to begin with; by September 15, the beets had shrunk in size to such extent that the finger could be thrust down between the beet and the soil around it, whereas two weeks earlier the soil was adhering close to the sides of the beet and firmly pressing around it. Moreover the foliage had dried up so that nothing but a tuft of young leaves on the head of the beet was remaining, and thus the sun struck with an unbroken force upon the organism. Until the rain of September 29 fell the prospect was quite alarming. Instead of approaching the normal sugar content and purity of juice indicative of maturing, those characteristics were diminishing, and it actually appeared as though the organism of the beet was falling in pieces. The climatic conditions, of which I have spoken, and their action upon the beet appear to have occurred in Europe this year. Robert Hennig, in his weekly letter from Berlin to the Louisiana Planter, remarks, "A most extraordinary circumstance is observed during this hot weather, viz, that the sugar in the juice does not increase." If the sucrose in the juice did not increase, the total sugar in the beets was falling away, because the weight of the beets was shrinking which should have made the sucrose in the juice rise. Mr. Hennig does not note this.

So far the tables given and the observations made upon them have related to the plats which were planted in April and May. At this juncture it will be well to produce data setting forth the behavior of the plats planted a month later and note the comparative action of the climatic conditions upon those beets.

The late beets were planted June 12, and upon the ground where two previous plantings had been destroyed by the wind storms. The plat was planted with six varieties of No. 1 grade home-grown seed and three grades of imported seed, all the conditions being equal. It has already been remarked that this planting germinated in an unusually short time, and the aftergrowth was uninterrupted and rapid. The best cultivation was given to the plats, the ground being absolutely without a weed, and it was being constantly moved by hoeing and cultivating. On September 1 it was estimated that the plats would weigh 14 tons to the acre, and having been so extremely late planted they had yet almost two months for further growth. Up to the date spoken of, September 1, their growth was not abated, and the appearance of the foliage was vigorous and of a deep green color. After the date noted the progress stopped, and it was apparent that even those late-planted plats could not endure any more of the drought.

When it was observed that the heat and continued drought were beginning to affect the late-planted plats and that they were at least ceasing to make weight, an experiment, on a small scale, was made in order to see what actual aid could be given by surface-watering, and what the difference would be between the watered and unwatered at the end of four or six weeks if the natural drought continued. To this purpose a breadth was selected across the whole plats and including all the varieties. From September 1 forward, each day, a little before sunset, all the beets upon the selected breadth were watered by means of sprinkling cans, about 60 buckets of water being supplied daily. When, a month later, the beets were dug up it was found that the water supplied had never gone into the ground deeper than 6 inches, and below that depth the soil was dry and hard. The action of the watering had been much less effectual than good seasonable rains would have been.

These late-planted plats were only analyzed once, because each variety did not contain more than a few hundred beets, most of which it was desirable to keep for seed production in the following year. Consequently the time of analyzing was

when it was supposed the beets had approximately reached their maximum of value in weight and sugar content. The following table gives the results:

Variety.	Seed.	Date.	Number of beets.	Mean weight of beets.	Brix.	Sucrose in juice.	Purity.
				Grams.	*Per cent.*	*Per cent.*	*Per cent.*
Elite Kleinwanzlebener	H	Sept. 28	20	317	20·1	16·4	81·5
Vilmorin Improved	H	...do	20	297	20·5	16·3	80·0
Dippe Kleinwanzlebener	H	...do	20	294	20·7	15·4	74·4
Lemaire	H	...do	20	290	20·2	15·3	75·7
Knauer	H	...do	20	310	20. 0	16·3	81·5
Desprez	H	...do	20	298	20·0	15·2	76·0
Original Kleinwanzlebener	I	...do	20	265	22·0	16	72·7
Lemaire	I	...do	20	300	19·3	14	72·5

It is seen that the beets had not attained to more than two parts in three of a normal size. The sugar content of every variety, however, was excellent, and the purity of the juices of several was fairly satisfactory. Although the drought had stopped the growth, the heat had not begun to exhibit its action in the depreciation of the sugar content.

It will be of interest at this place to give the weights per acre of each of the late planted plats, which, with the sugar content, will furnish the actual weight of the sugar per acre:

Variety.	Seed.	Date.	Weight per square rod.	Weight per acre.	Sucrose.	Sugar per acre.
			Pounds.	*Tons.*	*Per cent.*	*Pounds.*
Elite Kleinwanzlebener	H	Sept. 28	172	13·7	16·4	4, 513
Vilmorin Improved	H	...do	150	12·0	16·3	3, 912
Dippe Kleinwanzlebener	H	...do	161	12·8	15·4	3, 967
Lemaire	H	...do	178	14·2	15·3	4, 348
Knauer	H	...do	190	15·2	16·3	4, 955
Desprez	H	...do	178	14·2	15·2	4, 316
Original Kleinwanzlebener	I	...do	143	11·4	16·0	3, 661
Lemaire	I	...do	190	15·2	14·0	4, 620
Means of varieties from home-grown seed				13·5	15·8	4, 266
Means varieties from imported seed				13·3	15·0	3, 990

The weight per acre of all the varieties was low. In the month of August and even to September 1, it was estimated that the plats would attain a yield of approximately 18 tons. The result is almost 5 tons short of that estimate. That the estimate was not immoderate, and that it would have been realized with normal conditions of weather, is indicated by the results obtained where the watering was conducted.

The following table gives the weight per acre of the watered beets, the sucrose in the juice, and the sugar per acre, in comparison with the weight of beets and sugar per acre of the unwatered plats:

Comparison of beets grown on watered and unwatered plats.

Variety.	Watered beets.			Unwatered beets.	
	Weight per acre.	Sucrose.	Sugar per acre.	Weight per acre.	Sugar per acre.
	Tons.	*Per cent.*	*Pounds.*	*Tons.*	*Pounds.*
Elite Kleinwanzlebener	16·3	15·6	5, 241	13·7	4, 513
Vilmorin Improved	14·0	15·6	4, 284	12·0	3, 912
Dippe Kleinwanzlebener	15·1	14·4	4, 348	12·8	3, 967
Lemaire	17·0	15·0	5, 100	14·2	4, 348
Knauer	16·6	16·2	5, 376	15·2	4, 955
Desprez	18·3	14·6	5, 643	14·2	4, 316
Original Kleinwanzlebener	16·2	15·4	4, 989	11·4	3, 661
Means	16·2	15·3	4, 954	13·4	4, 238

The comparative columns of this table set forth very clearly the action of the dry weather upon the yield of beets and sugar. The watered beets have produced at the rate of over 700 pounds of sugar per acre in excess of the mean production of the unwatered plats. Consequently, it is quite reasonable to calculate that had rain fallen in moderate proportion during August and early September, the weight of beets would have been increased some 5 tons, and the sugar 1,000 pounds per acre. The same results of the drought were observed in a field of 50 acres grown by the Oxnard Beet Sugar Company in the immediate vicinity of the experiment station.

The effects of the great heat and drought lead me to consider at this place a question of great significance to beet culture in Nebraska. Hitherto the planting of beets on the bottom lands of the Platte Valley has been considered impracticable. Those lands lie very little above the normal flow of the river, the water level in places not exceeding 2 to 3 feet from the ground surface. In the spring, and particularly during the season when the work of early cultivation should be in progress, parts of those lands are frequently under water, and any acts of cultivation are impossible. In very dry seasons, however, all cultural work can be accomplished upon the lowlands as effectually as on the upper lands. This year has furnished an example, which was conducted under the direction of the station. Gottfried Hugo, one of the laborers upon the station during certain parts of the year, received seed from me and planted several rows of beets upon a low-lying patch of ground within the precincts of the town of Schuyler. The spring was moderately dry, which allowed the ground to be worked, and the beets to be planted early in May. The germination was rapid and the beets grew without hindrance or setback up to the time of maturity. On September 23, those beets were analyzed, and at the same time a similar number of beets grown by the same man, and from the same seed, but upon dry, light soil, was analyzed. The following are the results:

	Weight of beets.	Brix.	Sucrose.	Purity.
	Grams.	*Per cent.*	*Per cent.*	*Per cent.*
Moist ground	523	16·3	13·5	82·8
Dry ground	381	16·1	11·0	68·3

The results are worthy of much consideration. The beets on the dry-sand soil were dried out, the leaves had parched and withered. The moist-land beets had still, at the time of analysis, a full foliage, and were not even yet mature. The latter undoubtedly constituted a yield of 24 tons and with not less than 6,400 pounds of sugar per acre; while the production of the sand ground did not exceed 2,500 pounds of sugar to the acre. The results of the moist ground were obtained upon land which in the year 1891 was under water during the whole months of June and July. Good surface drainage and thorough cultivation, with a favorable season for the first crop, enabled a practical man to reach the results of which I have spoken.

BEET PRODUCTION ON THE BOTTOM LANDS.

The importance of the matter in consideration causes me to go outside the work directed by the station in order to consider an experiment upon a large scale of beet production on the bottom lands. The Standard Cattle Company, whose large enterprise is located at Ames, Nebr., in the current season planted 500 acres of beets on certain parts of their ranch, comprising some 6,000 acres. The elevation above the river of different parts of the tract may slightly vary, but the whole is comprised of so-called bottom lands. The resident director of the company, R. M. Allen, has carried out an extensive and excellent system of surface drainage by means of open ditches, the smaller cross ditches emptying into the larger ones, which carry the water off to the river. As a result of the drainage, aided by a favorable spring

time, 500 acres of land were gotten into a condition for planting. The plants grew well from the beginning, and when the dry, hot season set in they still maintained the fresh appearance and growth. A satisfactory yield was obtained and the beets were delivered in good condition to the factory.

In view of the success that has been cited the question of beet culture upon the bottom lands should be reconsidered. The normal rainfall of the region, in combination with the high temperatures and drying winds, makes it very desirable that the ground should possess one factor which may act as a gauge when those climatic conditions are specially adverse. The normal season in Nebraska is somewhat deficient in moisture for beet culture, and wet years, such as 1891, are rare. It is thus probable that upon well selected, well drained, and properly cultivated ground, taking the seasons in the mean, the bottom lands may be uniformly the most reliable for beet production in that State. The indispensable condition is, however, that a system of removing readily the surface water, such as has been carried out by Mr. Allen, must be adopted. Without such drainage beet culture on those lands remains impracticable.

I would suggest that an experiment also be made next season in growing seed upon the bottom lands. The unfavorable factor in seed production upon the upper bottoms and uplands has been the dryness of the soil at the time of maturing the seed. The moisture of the bottom lands will probably control that disadvantage, whilst the Nebraska sun will secure excellent maturity on any land.

COMPARATIVE PRODUCTIONS OF HOME-GROWN AND IMPORTED VARIETIES OF BEET SEED.

The taking of the weights per acre of all the varieties was conducted October 6, and by the method described in my previous reports. The final chemical examination of the beets was made October 12, after an interval of some ten days from the previous analytical review. In the following table the last sugar reading of the crop is given, after which the weights of the varieties will be compared, and the yield of beets per acre, with the sugar content, will make it possible to state the results of each variety, and the comparative productions of the home-grown and imported varieties of seed.

Variety.	Seed.	Date.	Number of beets.	Weight of beets.	Brix.	Sucrose.	Purity.
				Grams.	*Per cent.*	*Per cent.*	*Per cent.*
Original Kleinwanzlebener	I	Oct. 11	50	300	16·6	12·9	77·7
Vilmorin Improved	I	...do....	50	312	17·4	14·1	81·0
Elite Kleinwanzlebener	H	...do....	50	467	17·8	14·1	79·1
	I	...do....	50	391	17·5	13·3	75·0
Knauer	H	Oct. 12	50	489	17·1	13·6	79·5
	I	...do....	50	452	17·9	14·0	78·2
Lemaire	H	...do....	50	387	17·0	13·2	77·6
	I	...do....	50	382	17·0	13·1	77·0
Desprez	H	...do....	50	391	17·9	14·2	79·3
Mette's Specialität	I	...do....	50	321	17·7	14·0	79·0
Vilmorin Improved (second planting)	I	...do....	50	355	17·7	13·9	78·5
Mette's Rosa Elite	I	...do....	50	366	15·7	11·7	74·5

These maximum sugar readings of the early planted plats are very low. The beets never recovered from the action of the drought and heat which has been already duly discussed.

The following table gives the weight per acre of the given varieties grown from home-grown and imported seed:

Variety.	Seed.	Date.	Pounds per square rod.	Yield per acre.
				Tons.
Original Kleinwanzlebener	I	Oct. 6	143·0	11·4
Vilmorin Improved	I	...do....	190·0	15·2
Elite Kleinwanzlebener	H	...do....	286·0	22·9
Do	I	...do....	253·0	20·4
Knauer	H	...do....	287·0	23·0
Do	I	...do....	265·0	21·2
Lemaire	H	...do....	235·0	18·8
Do	I	...do....	201·0	16·0
Desprez	H	...do....	247·0	19·7
Mette's Specialität	I	...do....	184·0	14·7
Vilmorin Improved (second planting)	I	...do....	207·0	16·5
Mette's Rosa Elite	I	...do....	230·0	18·4

	Tons.
Mean of varieties from home-grown seed	21·1
Mean of varieties from imported seed	17·9

A further table, embracing the weight per acre and the sucrose in the juice, will furnish the yield of sugar per acre of each variety:

Variety.	Seed.	Weight per acre.	Sucrose in juice.	Sugar per acre.
		Tons.	*Per cent.*	*Pounds.*
Original Kleinwanzlebener	I	11·4	12·9	2,941
Vilmorin Improved	I	15·2	14·1	4,286
Elite Kleinwanzlebener	H	22·9	14·1	6,453
Do	I	20·4	13·3	5,426
Knauer	H	23·0	13·6	6,256
Do	I	21·2	14·0	5,936
Lemaire	H	18·8	13·2	4,963
Do	I	16·0	13·2	4,192
Desprez	H	19·7	14·2	5,594
Mette's Specialität	I	14·7	14·0	4,116
Vilmorin Improved (second planting)	I	16·5	13·9	4,587
Mette's Rosa Elite	I	18·4	11.7	4,305

Mean yield of sugar per acre from home-grown seed, 5,814 pounds.
Mean yield of sugar per acre from imported seed, 4,472 pounds.

The mean of production of the imported seed is specially lowered by the results of the Original variety, which were reduced by the action of the dust storm in June. The mean results of the Elite, Knauer, and Lemaire varieties are the most strictly comparative and conclusive, and are as follows:

	Pounds per acre.
From home-grown seed of those varieties	5,891
From imported seed of those varieties	5,185

The production of sugar per acre from the home-grown seed on the early-planted plats was 706 pounds, or 12 per cent greater than that of the imported seed of the same varieties, under corresponding conditions of soil, climate, and culture.

The mean of the results of the early and late planted plats is shown by the following table:

Time of planting.	Weight per acre.	Sucrose in juice.	Purity of juice.	Sugar per acre.
	Tons.	*Per cent.*		*Pounds.*
May planting	19·5	13·7	78·0	5,538
June planting	13·4	15·4	76·8	4,128
Means	16·4	14·5	77·4	4,833

A further table gives the comparative results of the three seasons during which the station has existed:

Season.	Weight per acre.	Sucrose in juice.	Purity of juice.	Sugar per acre.
	Tons.	*Per cent.*		*Pounds.*
1891	21·7	14·6	85·2	6,236
1892	15·8	15·1	79·6	4,800
1893	16·4	14·5	77·4	4,833
Means	18·0	14.7	80·7	5,290

If the results of the Schuyler Station for the three seasons be compared with the mean results of the sugar-beet station of the French Government at Cappelle, France, for 1891 and 1892, they appear as follows:

Station.	Weight of beets per acre.	Sugar per acre.
	Tons.	*Pounds.*
Cappelle (France)	17·5	5,366
Schuyler (Nebraska)	18·0	5,290

The table giving the results of the station during the three seasons shows that the mean results of this season are almost identical with those of 1892. Both seasons, however, are far behind the very excellent crop of 1891, when the tonnage, sugar per acre, and the purity of the juices were most satisfactory. The conditions which conduced to the very superior results of the crop of 1891 have been fully discussed under the heading of Special Experiments.

SPECIAL EXPERIMENTS.

During the analytical seasons of 1891 and 1892 certain special experiments were conducted with the purpose of determining the loss of weight of the beet by evaporation, and the cause of the loss of sugar which takes place in the organism, particularly during that interval of time between the removal of the beets from the soil and the period of storage in the silos. By means of those experiments it was shown conclusively that high temperature, and particularly the action of strong sunlight, are the primary causes of the decomposition of the sucrose, and that a system of cold storage would effectually protect the organism against such a change in its constituents and the resulting loss of sugar. Those experiments afforded such conclusive data that it has not been considered necessary to continue the experimentation along that particular line this season.

I, however, conducted a series of experiments in order to obtain light upon one other highly important question. It has been, and is still, maintained, and by very noteworthy authorities, that excessive moisture falling upon the beets, either before or after their removal from the soil, causes a decrease or loss in the content of sugar and a signal depreciation in the quality of the beet. The observations made in the experiments of last year and which are found in the report showed conclusively that the fall in the sucrose content of the juice after rains was invariably accompanied by a corresponding, or even greater, increase in the weight of the beet. These observations caused me to doubt wholly the accepted conclusions concerning the action of moisture upon the sugar content. Moreover, there does not appear, physiologically, a probable expectation that such action would transpire. There is, on the other hand, reason for supposing that a deficiency of moisture would retard the formation of sucrose; first, because a normal water content is essential to the elaboration and transport of the constituents in the organism; and further, an

excess of water is indispensable to the formation of the carbohydrates. Scientifically speaking, we have in these considerations the explanation of the decrease of sugar which took place this year in September, of which I have already exhaustively spoken.

This year the specific object was to observe the action of water upon the organism of the beet. The season was peculiarly favorable to the purpose. The experiments were commenced at the period when, as previously related, the beets were depreciating under the influence of drought and heat. The experiments were conducted by taking up a given number of beets, dividing the number into two or more identical parts, and analyzing one part immediately and placing the other part under the action of excessive moisture until analyzed after a definite lapse of time. The work of dividing the original number of beets into identical halves was conducted according to the method used last year, and which was based upon the physiological constant that I had observed, viz: Any two or more lots of beets taken from the same plat and containing the same number of individuals and having the same weight will contain the same total solids and sucrose. Without some such constant, comparative tests would be strictly impracticable, as there would not be a standard of comparison. The constant, whose principle I have expressed, afforded the standard required.

In the examples to be given the beets were taken fresh from the soil, washed and dried and divided into two parts, and each part weighed. One part was analyzed at once and the other part treated as will be explained.

Experiment I.

One hundred and fifty beets were dug up and, after washing, were divided into three "fifties." No. 1 "fifty" were weighed and analyzed directly. No. 2 were weighed and afterwards laid out in the field under normal exposure. No. 3 were packed in a tub with sand and soaked with water, also a large block of ice being laid upon the packed beets, which kept down the temperature, the water overflowing as the ice melted. The weights of the respective parts were identical, each "fifty" weighing exactly 41·5 pounds.

No. 1.—*Analysis of fresh beets.*

Number of beets.	Brix.	Sucrose.
Mean of—	*Per cent.*	*Per cent.*
10 beets	19·9	15·0
10 beets	19·3	14·6
10 beets	20·7	15·8
10 beets	19·5	14·0
10 beets	19·7	14·8
Means	19·8	14·8

The mean purity was 74·2.

No. 2.—*Analysis of exposed beets.*

Mean of—	*Per cent.*	*Per cent.*
10 beets	23·4	18·9
10 beets	23·6	17·9
10 beets	22·5	16·9
10 beets	22·6	16·7
10 beets	22·5	16·0
Means	22·9	17·1

The mean purity was 73·7.

NO. 3.—*Analysis of soaked beets.*

Number of beets.	Brix.	Sucrose.
	Per cent.	*Per cent.*
Mean of—		
10 beets	18·4	14·2
10 beets	18·6	14·4
10 beets	18·3	14·0
10 beets	18·1	13 6
10 beets	18·5	14·3
Means	18·3	14·1

The mean purity was 77.

The following table presents an analysis of the results of the three separate analyses:

Beets.	1. Weight.	2. Weight.	Variation of weight.	Brix.	Sucrose.	Content of sugar.
	Pounds.	*Pounds.*	*Per cent.*	*Pr. ct.*	*Per cent.*	*Pounds.*
Fresh beets	41·5	....	....	19·8	14·8	6·14
Exposed beets	41·5	34·0	Loss, 19·05	22·9	17·1	5·08
Soaked beets	41·5	44·0	Gain, 6·02	18·3	14·1	6·20

These data not only indicate the actual results, but also the ease with which the indications could be misunderstood. Although the exposed beets give a much higher polariscope reading, an actual loss of 6 per cent of the total sugar had occurred. On the other hand the polariscope reading of the juices from the soaked beets was notably lower, yet those beets had more than maintained their sugar content. It may also be remarked that the moistened beets which had taken up 6·2 per cent of their own weight of water gave a juice of much higher purity, being 3 per cent higher than the fresh beets. In the polariscope tube the juices of the moistened beets read with great ease, whilst the others were difficult to read.

The results of the given experiments were not only satisfactory, but they were striking, from the circumstance that a slight appreciation was observed in the sucrose content and a notable one in the purity. With such a result from placing the beets for seventy-two hours in soaked sand it was determined to experiment with a further number actually submerged in water.

Experiment II.

One hundred beets were dug up, washed, and divided into two identical parts. The first fifty were weighed and analyzed directly. The second fifty were weighed and placed in a tub of water whose temperature was kept at 40°–42° by addition of ice, the tub being placed in one of the silos. The submerged beets remained in the water for precisely seven days. When taken out they were dried and reweighed and immediately analyzed. The following are the results:

NO. 1.—*Analysis of fresh beets.*

Number of beets.	Brix.	Sucrose.
	Per cent.	*Per cent.*
Mean of—		
10 beets	17·4	12·0
10 beets	18·4	12·6
10 beets	18·6	13·4
10 beets	19·0	13·4
10 beets	19·2	14·3
Means	18·5	13·1

The mean purity equals 70·8.

No. 2.—*Analysis of submerged beets.*

Number of beets.	Brix.	Sucrose.
Mean of—	*Per cent.*	*Per cent.*
10 beets	16·4	12·7
10 beets	16·7	13·1
10 beets	16·4	12·8
10 beets	16·6	13·1
10 beets	16·5	13·0
Means	16·5	12·9

The mean purity equals 78·2.

Analytical comparison of the results.

Beets.	1. Weight.	2. Weight.	Variation of weight.	Brix.	Sucrose.	Content of sugar.
	Pounds.	*Pounds.*	*Per cent.*	*Pr. ct.*	*Per cent.*	*Pounds.*
Fresh beets	34·5	....	....	18·5	13·1	4·51
Submerged beets	34·5	40·0	Gain, 15·9	16·5	12·9	5·16

This table states that the submerged beets took up water during seven days' submersion to the extent of 15·9 per cent of their weight, and that the actual sugar content was increased 14·2 per cent.

In the first place, in consequence of the results obtained, I am obliged to reconsider an observation stated in my report of 1891, in which it is doubted that the beet can increase its sugar content after removal from the soil. These experiments indicate that such an increase has certainly occurred in beets under the conditions in which those examples under consideration were placed. The appreciation in the purity of the juices is also not less notable than the increase in the sucrose. The increment of weight was expected, and particularly considering the wilted condition in which the fresh beets were found. The results are extraordinary. They were, however, conducted with the most extreme care, every act of manipulation in the analysis being performed by me personally, which enables me to vouch for the greatest attainable accuracy.

At the time that the above experiment was completed the beets were suffering to a final degree from the influence of the dry soil and hot sun. A third experiment was made of the same nature as the two already tabulated, but the latter was carried out in the field. In a given plat of beets a certain row was selected and a length of the row including exactly 100 beets was marked off. To those 100 beets 250 gallons of water were given, the loose soil raked up close to the beets to prevent the sun baking the moist surface, and the beets were left for 7 days. At the end of that time those beets were dug up, washed, weighed, and analyzed. At the same time 100 beets comprised within the same length of a paralled row, this row being separated from the watered row by five intervening rows, were taken up, washed, weighed, and analyzed, and the following are the results:

Experiment III.

Unwatered beets.	Brix.	Sucrose.
Mean of—	*Per cent.*	*Per cent.*
10 beets	18.4	14·1
10 beets	18·4	13·3
10 beets	18·3	13·3
10 beets	18·3	13·7
10 beets	19·3	14·0
10 beets	19·3	13·8
10 beets	18·9	13·0
10 beets	19·2	13·7
10 beets	19·0	13·3
10 beets	19·1	12·8
Means	18·8	13·5

The mean purity was 71·8.

Experiment III—Continued.

Watered beets.	Brix.	Sucrose.
Mean of—	*Per cent.*	*Per cent.*
10 beets	16·7	12·6
10 beets	16·8	12·8
10 beets	16·8	13·1
10 beets	17·3	13·4
10 beets	16·0	12·2
10 beets	16·4	12·8
10 beets	15·8	12·2
10 beets	16·3	12·7
10 beets	17·4	13·6
10 beets	16·8	12·8
Total means	16·6	12·8

The mean purity was 77·2.

Comparison of the results.

Beets.	Weight.	Variation of weight.	Brix.	Sucrose.	Content of sugar.
	Pounds.	*Per cent.*	*Per cent.*	*Per cent.*	*Pounds.*
Unwatered beets	78·5		18·8	13·5	10·59
Watered beets	88·5	Gain 12·7	16·6	12·8	11·32

The experiment furnishes results identical with those obtained in the two preceding experiments. It must be observed, however, that in the last experiment the data are not as strictly comparative. The parallel rows from which each 100 beets were taken were apparently similar, but there may have been a small difference in the weight and sucrose content at the time that the beets were watered. No difference, however, could have existed which would have amounted to even 10 per cent of the difference found at the time of analysis. It is most evident that the excessive quantity of water added to the 100 beets (250 gallons, which was 2½ gallons to each beet) not only caused a great increment of weight, but also an immediate formation of sugar, and the appreciation in the purity of the juices is very striking. In each of the experiments it is shown that the presence of excessive moisture raised the purity coefficient most notably, and in the last two experiments 7 and 8 points, respectively. This observation is strictly in accord with the general observations relating to the crops of each season since the station has been in operation. In 1891 the whole cultural season was very wet (see table of the climatics for the three seasons), and at the time that the beets were harvested the ground was saturated with moisture, the rainfall for October of that year being four times greater than the normal. The crop of that season averaged 21·7 tons per acre; the average sucrose in the juice was 14·6 per cent, and the mean purity of all varieties was over 85. In 1892 the crop was notably lighter and the sucrose in the juice higher, owing to the dry season, but the mean purity was less than 80, the soil, mode of culture, and the seed being the same.

In the series of special experiments conducted at the station results have been obtained which are more or less in direct opposition to certain accepted beliefs. Last year the experiments showed that not only no gain but an actual loss, and a very notable loss, of sugar occurs when beets are exposed to atmospheric influences after their removal from the soil; the special causes of that loss being strong sunlight and high temperature. Again, the results of experimentation during this year have indicated quite conclusively that, in an abnormal season, when the beets are depreciating in sugar content and quality, under the influence of high temperature and a dried-out soil, the depreciation can be checked and the conditions reversed by a timely application of water. Further, the observations of this year have shown

that beets can be placed in soaked sand or even submerged in water at a given temperature for a term of seven days, and not only is there no depreciation found, but, with the increment of weight, an increase in the sugar content of the beet and a very notable appreciation in the purity of the juices are observed.

In placing the results of these experiments on record it is desirable and very appropriate that the views which stand in opposition to these results and the noteworthy authorities by whom those views have been held be kept in recollection. A revision of the theories which have been held in relation to the questions under discussion should only be considered when the data supporting some other view are sufficiently conclusive and important to make such a revision imperative.

Before leaving this part of the report the importance of shipping the beets directly to the factory as soon as they are dug up should again be urged upon the beet-growers; I submit also, for the consideration of the factory owners, the results which have been obtained bearing upon the action of excessive moisture in relation to the preservation of the beets. The practice of dumping hundreds and, at times, thousands of tons of beets in dry sheds, where they may lie from a week to ten days before being worked up by the factory, is known to cause fermentation, loss of sugar, and difficulties in manufacture which it is desirable to avoid. I am impressed with the belief that those large masses of beets would be, at any temperature, better preserved by submersion, and would also be in a better condition to be handled in the factory. And in the event of a freeze, which in November may be very severe but of short duration, submersion would be the most perfect mode of preservation.

CONCLUSIONS.

A review of the work of this season and of the results of the seasons of 1891 and 1892 indicates the following conclusions:

Native seed has been produced of excellent quality and high germinating power. The yield per acre, owing to the extreme drouth which prevailed during the maturing season of this year, as likewise in 1892, was lower than would be obtained with an increased rainfall. An experiment in growing seed upon well-selected tracts on the bottom lands of the Platte Valley is recommended.

The comparative experiments in which home-grown seed was planted by the side of imported seed of the same varieties, and under the same conditions of soil and cultivation, have shown the greater vitality and productiveness of the native seed, the latter yielding 706 pounds, or 12 per cent, of sugar more to the acre than the seed imported from France and Germany.

Attention has been directed to the highly satisfactory results which have been obtained in growing beets upon certain tracts of bottom land in the Platte Valley, where an excellent system of surface drainage has been adopted in preparing the land for beet culture.

Special experiments conducted during the seasons of 1891, 1892, and 1893, were devoted to the study of influences causing loss of weight and sugar in the beet and to modes of preventing such loss. It has been found that high temperature and direct sunlight are the main causes of the decomposition of sugar in the organism, and that storing at low temperature prevents such decomposition. Moreover, the experiments of this season have indicated that excess of moisture is not an immediate cause of depreciation of quality in the beet, and that, under given conditions, submersion of the beets in water for a limited length of time may be found an excellent mode of preservation.

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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF CHEMISTRY.

EXPERIMENTS WITH SUGAR BEETS IN 1897.

BY

HARVEY W. WILEY,
Chemist of the United States Department of Agriculture.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1898.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D.C., April 21, 1898.

SIR: The bulletin herewith presented as No. 52 of the Division of Chemistry comprises the portion of the report which was prepared by the Chemist of the Department for the Special Report on the Beet Sugar Industry of the United States, submitted by you to the President of the United States and by him transmitted to Congress, and published as Document No. 396 of the House of Representatives at the second session of the Fifty-fifth Congress. It is deemed advisable to secure the publication of this part of the report as a bulletin of the Chemical Division in order to preserve the continuity of the reports on the sugar industry of the United States as bulletins of that division. No changes have been made in the text, nor in the illustrations accompanying it, from the document mentioned above.

H. W. WILEY,
Chief, Division of Chemistry.

Hon. JAMES WILSON,
Secretary.

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REPORT OF THE CHEMIST.

H. W. WILEY.

LETTER OF SUBMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., March 2, 1898.

SIR: I submit herewith for your consideration the manuscript containing the data of recent investigations on the growth of sugar beets and the manufacture of sugar therefrom.

Respectfully,

H. W. WILEY,
Chief of Division of Chemistry.

Hon. JAMES WILSON,
Secretary of Agriculture.

PREFATORY NOTE.

The investigations conducted by the Department of Agriculture for many years in the study of sugar-producing plants and methods of manufacturing sugar in the United States were suspended by order of Secretary Morton in 1893. In resuming the study of this subject by order of Secretary Wilson, it is important that citations to the work already done be presented. The student of the subject will be able from these citations to have a general idea of the scope of the work which has been accomplished, and will be guided in further research by the data contained in the brief résumé which will be appended. It is not possible in such a list of citations to refer to the work which has been done by the agricultural experiment stations nor by private individuals. A collection of the titles of all accessible works in English relating to the subject of the sugar beet has been issued by the library of this Department as the library bulletin for June, 1897, entitled References to the Literature on the Sugar Beet, Exclusive of Works in Foreign Languages.

In the résumé of citations given below are first noted the publications which have been made in the annual reports of the Department of Agriculture, and afterwards a list of the special bulletins relating to beet sugar will be found. Many important papers have been published in the annual reports, which students of the beet-sugar industry might wish to consult. It is interesting to know that as early as 1867 Dr. Antisell, at that time the Chemist of the Department, pointed out the probability that an area or belt suited to the culture of the beet might be mapped out. He gave also some of the probable data which would be used in determining the limits of this belt. The annual report for 1868 contains a reference to the fact that Henry Clay visited Europe and made a study of the beet-sugar industry on the Continent, and presented the results of his studies in a speech delivered in the Congress of the United States. Careful search of the records has not been able to discover this report in print.

It is to be regretted that many of the agricultural reports are entirely out of print, and the same is true of the greater part of the bulletins which have been issued on the subject of beet sugar. It will therefore not be possible for the Superintendent of Public Documents to supply the bulletins which are marked out of print to those who may desire to secure them.

Following the résumé of the work already done is given an account of the investigations conducted under the supervision of the Chemical Division of this Department during the year 1897.

REFERENCES IN ANNUAL REPORTS OF THE DEPARTMENT OF AGRICULTURE TO MATTERS RELATING TO THE SUGAR-BEET INDUSTRY.

1862. 536. Relative to the composition of beet juice.

1867. 32. Report of Thomas Antisell, Chemist, Department of Agriculture.

Dr. Antisell indicates the following as the probable "beet belt," based on temperature conditions:

"The northern limit of the beet culture is doubtful. On the plains of Russia it is grown where the isocheimal line is 10°. If this would hold good on this continent, there is no portion of the United States too cold for its culture. This vast extent of country is naturally divided into two regions, viz: (1) The middle division of the temperate zone of the United States, lying between parallels 39 and 43, comprising Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Iowa, Nebraska, southern Idaho, with an area of 453,000 square miles, is favorable to beet culture, the mean annual temperature varying between 47° and 53° F; (2) the district between parallels 36° and 39°, embracing the border States, Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, Missouri, with Kansas, Colorado, Utah, Nevada, and northern California, possessing an area of 675,000 square miles and a mean annual temperature of 58° to 60° F., is also favorable to the beet; so that a belt of country 7° wide in latitude and with an extent of 1,129,000 square miles is open to this industrial art."

In experiments in beet culture on the Department grounds the maximum percentage of sugar in the juice is given for each variety:

Variety.	Number of tests.	Per cent of sugar.
White Silesian:		
Red top	12	6.97
Green top	10	7.20
White Magdeburg	12	7.74
Improved White Imperial	11	7.34
Beta Imperialis:		
No. 1	12	6.70
No. 2	12	7.40
Vilmorin's Improved	12	7.40
Castlenandry Yellow	12	8.00

1867. 48. Methods of sugar manufacture in Europe.

1868. 158. Report of Theodore Gennert to the Commissioner of Agriculture. A general article on the statistics and manufacture of beet sugar.

1868. 164. Notes on the manufacture of beet sugar in Europe.

In 1867 the Department sent nine varieties of seed to Chatsworth, Ill., for trial, with the following results:

	Polarization.		Polarization.
No. 1	11.90	No. 7	11.98
2	10.95	8	13.67
3	12.59	9	13.25
4	12.21		
5	11.57	Average	12.40
6	13.52		

Mention is made in this article that while in Europe Henry Clay took much interest in the beet-sugar industry and afterwards, in a speech in Congress, predicted great results from the introduction of the industry into the United States.

1869. 334. A review of the manufacture of sugar in Europe.

1869. 345. A letter included in the above review. It reviews the manufacture in Europe and mentions trials made in the United States. The first attempt to produce beet sugar in this country, mentioned in this review, was by John Vaughn and James Ronaldson, Philadelphia. Seed was imported and beets were grown, but no factory was built.

1870. 98. Report of the Chemist on Beet Sugar. He states that the returns of the growth of sugar beets in this country have not yet shown an approach to that amount of sugar which is yielded by the growth of France and northern Germany. Beets grown at Chatsworth, Ill., from seeds supplied by the Department of Agriculture contained from 9.31 to 11.24 per cent of sugar.

1870. 215. Progress of the beet sugar industry in Europe. A brief statistical article.

1870. 210. Largely historical. Three establishments were in operation—Chatsworth, Ill., Alvarado, Cal., Sauk County, Wis. Capacity of the Chatsworth factory, 50 tons of beets per day.

1872. 154. Report of Ryland T. Brown, Chemist, United States Department of Agriculture. Following are some of the chief points mentioned:

The experiments of David L. Child, at Northampton, Mass., 1838, are probably the earliest recorded in this country.

The factory of Bonesteel and Otto, at Fond du Lac, Wis., 1867, had a capacity of 10 tons of beets per day; capital, $12,000.

Analyses of beets grown on the experimental farm of the University of Virginia, 1872, viz:

Variety.	Weight.	Sugar in the juice.
	Ounces.	*Per cent.*
White Silesian (French seed)	$24\frac{3}{4}$	11.75
Carter's Prize Nursery (English seed)	16	13.72
Vilmorin's Improved (French seed)	$30\frac{1}{2}$	12.54
White sugar beet (Philadelphia)	$33\frac{1}{2}$	10.17

1872. 451. April, 1872, the legislature of New Jersey passed an act, operative for ten years, exempting beet-sugar factories from taxation.

1873. 108. A brief report by the Statistician.

The two California factories produced an estimated total of 750 tons of sugar during 1873.

1873. 287. Relative to the capacity and product of the Alvarado factory. Capacity, 7,000 tons of beets per annum.

1875. 512. A résumé of a German report on the composition of sugar beets.

1876. 153. Statistics of the production of sugar in various countries. Mention is made in this article of a factory at Soquel, Santa Cruz County, Cal. The State Agricultural Society of California reported in 1874 that the production of beet sugar in the State amounted in 1870 to 500,000 pounds; in 1871 to 800,000 pounds; in 1872 to 1,125,000 pounds, and in 1873 to 1,500,000 pounds.

1876. 266. Statistics of the yield of beet sugar, by countries.

1877. 243. A brief statement as to soils suitable for beets.

1877. 579. German statistics.

1878. 117. Analysis of a sample of beet-root sirup.

1879. 67. A report on the analysis of seven sugar beets received from various parts of the country. The percentage of sugar in the juice ranged from 8.9 to 14.3, the latter sample being from Oswego, N. Y.

1879. 184. General sugar statistics.

1880. 9. Report of the Commissioner of Agriculture. A report of the condition of the Maine Beet Sugar Company and a statement of the experiments in Delaware were made. Capacity of the Maine factory, 150 tons per day. In 1877 the State legislature of Delaware appropriated $300 as premiums to farmers for crops of sugar beets, and in 1878 $1,500 were appropriated for the same purpose. Imperfect experiments were made in 1878 by the Delaware Beet Sugar Company. The total crop amounted to 350 tons of roots, yielding an average of 9 per cent of sugar. A new factory was built by Colwell Brothers, of New York, costing $30,000, with a capacity of 60 tons of roots per day of twenty-four hours. The company did not make running expenses, but the experiment was encouraging.

1880. 619. A letter from E. H. Dyer urging a bounty law.

1881. 675. Statistics of sugar production. Statistics of domestic sugar are given in brief. Beet sugar was made successfully for three successive seasons in California in one factory. The Maine factory, which was in operation for three seasons, producing in one year 1,200,000 pounds and in another 1,000,000 pounds of sugar, was obliged to suspend operations for want of beets, which the farmers thought they could not grow at the prices offered, namely, $5 to $6 per ton.

1884. 22. Report of H. W. Wiley to the Commissioner of Agriculture on the Northern sugar industry in 1883. This is an abstract of data given in Bulletin No. 3 of the Division of Chemistry.

1884. 529. Yield of beet sugar in Russia.

1886. 341. Analyses of sugar beets grown in various parts of the country. Most of these samples contained very little sugar, with one exception. This sample contained 18.84 per cent, and was from Menominee, Mich. The highest percentage of sugar in the other samples was 11.71. Twenty-eight tests were made.

1889. 140. Cultivation of the sugar beet. Report of the Chemist.

1890. 167. Experiments with sugar beets. Abstract of a report published in full in Bulletin No. 27 of the Division of Chemistry.

1891. 150. Experiments with sugar beets. Abstract of a report published in full in Bulletin No. 30 of the Division of Chemistry.

1891. 156. Laws relating to taxation and bounties in various countries.

1892. 128. A résumé of experiments with sugar beets. Full details of this work are published in Bulletin No. 36 of the Division of Chemistry.

1892. 467. Statistics of beet-sugar production for the year 1892:

	Pounds.
Utah Beet Sugar Company	1,473,500
Alameda Sugar Company	2,506,860
Western Beet Sugar Company	11,390,921
Chino Valley Beet Sugar Company	7,903,541
Oxnard Beet Sugar Company	2,110,100
Norfolk Beet Sugar Company	1,698,400
Total	27,083,322

In 1891 these factories produced a total of 12,004,838 pounds.

1893. 175. Experiments with sugar beets. This is an abstract of a report published in full in Bulletin No. 39 of the Division of Chemistry.

1893. 184. Growth of beets at different altitudes.

LIST OF BULLETINS ISSUED BY THE DIVISION OF CHEMISTRY RELATING IN WHOLE OR IN PART TO SUGAR BEETS.

Bulletin No. 3, Division of Chemistry, Department of Agriculture. The Northern Sugar Industry; edited by H. W. Wiley, 1884; pp. 118 (out of print). Pages 24 to 29 of this report relate to the beet sugar industry.

Bulletin No. 5, Division of Chemistry, Department of Agriculture. The Sugar Industry of the United States; edited by H. W. Wiley, 1885; pp. 224 (out of print). Part second of this report, including pp. 73 to 136, inclusive, 12 plates, relates to the beet-sugar industry.

Bulletin No. 27, Division of Chemistry, Department of Agriculture. The Sugar Industry: Culture of the Sugar Beet, and Manufacture of Beet Sugar; edited by H. W. Wiley, 1890; pp. 262 (out of print).

Bulletin No. 30, Division of Chemistry, Department of Agriculture. Experiments with Sugar Beets in 1890; edited by H. W. Wiley, 1891; pp. 93 (out of print).

Bulletin No. 33, Division of Chemistry, Department of Agriculture. Experiments with Sugar Beets in 1891; edited by H. W. Wiley, 1892; pp. 158 (out of print).

Bulletin No. 36, Division of Chemistry, Department of Agriculture. Experiments with Sugar Beets in 1892; edited by H. W. Wiley, 1893; pp. 74 (out of print).

Bulletin No. 39, Division of Chemistry, Department of Agriculture. Experiments with Sugar Beets in 1893; by Harvey W. Wiley, with the collaboration of Walter Maxwell, 1894; pp. 59.

MISCELLANEOUS BULLETINS AND REPORT.

Special Report No. 28, United States Department of Agriculture. Report on the Culture of the Sugar Beet and the Manufacture of Sugar Therefrom, in France and the United States; by Wm. McMurtrie, 1880; pp. 294 (out of print).

Farmers' Bulletin No. 3, United States Department of Agriculture. Culture of the Sugar Beet; by H. W. Wiley, 1891; pp. 24 (out of print).

Farmers' Bulletin No. 52, United States Department of Agriculture. The Sugar Beet: Culture, Seed Development, Manufacture, and Statistics; by H. W. Wiley, 1897; pp. 48.

PLAN OF THE INVESTIGATIONS FOR 1897.

On the 11th day of January, 1897, the following letter was addressed to the Secretary of Agriculture:

SIR: Numerous inquiries for sugar-beet seed have come to this division instead of to the seed division, and I am unable to give any definite answer to our correspondents in respect of the policy of the Department regarding the distribution of the seeds in question. I would be glad to know if it would be possible for the Department of Agriculture to provide a few thousand packages of high-grade beet seed which could be distributed to inquiring farmers. There is a widespread interest in this country in the sugar-beet industry, and it appears to me that a part of the money voted by Congress for the distribution of seeds could be very profitably used in supplying experimenters with the best quality of sugar-beet seed. Farmers can not be certain in buying beet seeds from dealers that they are getting anything more than the ordinary quality of garden seeds. The guaranty of the Department, however, that they are securing high-grade sugar-beet seeds would be of great advantage.

I am now engaged in a revision of Farmers' Bulletin No. 3, to be used in supplying the information which is so largely asked for respecting the culture of the sugar beet and the manufacture of sugar therefrom. It would be of interest to make a statement in this bulletin in regard to the possibility of securing the seeds from the Department. An early reply to this inquiry will be appreciated.

I am, respectfully,

H. W. WILEY, *Chief of Division.*

The honorable the SECRETARY OF AGRICULTURE.

In reply to this request, in the following letter the information was conveyed that no funds were available for the purchase of beet seeds:

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE ASSISTANT SECRETARY,
Washington, D. C., January 13, 1897.

DEAR SIR: The Secretary has handed me your letter of the 11th instant, calling his attention to the advisability of distributing some sugar-beet seed in connection with the present Congressional seed distribution.

If this matter had been mentioned in time it would have been possible to purchase a supply of beet seed. As it is now, however, the whole appropriation for the purchase of seed is exhausted. There is not a dollar left with which sugar-beet seed could be purchased. If you will bring the matter up early next June it will be possible to include sugar-beet seed in the distribution of the following year.

Very truly, yours,

CHAS. W. DABNEY, JR., *Assistant Secretary.*

DR. H. W. WILEY, *Chemist.*

All further attempts to reestablish the investigations looking to the introduction of the sugar-beet industry in the United States, which had been suspended during four years, were therefore deferred to await the action of the new Administration.

Immediately after Secretary Wilson assumed the duties of his office, arrangements were made for a renewal of the investigations, but that date was entirely too late to purchase seeds directly from the growers in Europe; therefore arrangements were made with the Oxnard Beet Sugar Company, which kindly offered to donate the quantity of seed required for the purpose. As rapidly as possible the seeds were sent

to different parties in the United States interested in the subject, special attention being given to distributing the seed in those localities where the theoretical conditions for the production of sugar were the best. Packages were sent directly to the addresses of parties in different parts of the country, and large quantities of seed were distributed through the media of agricultural experiment stations, boards of trade, business men's associations, and others interested particularly in the culture. It is impossible, therefore, to determine the number of persons who were actively engaged in the work during the year.

In so far as possible the cooperation of the agricultural experiment stations was secured, it being deemed advisable to conduct the experiments in each State under the direct auspices of the State authorities. It was only when such cooperation could not be secured or where preference was shown for direct communication with the Department of Agriculture, and in miscellaneous cases, that the experiments were conducted directly under the auspices of the Department. Copies of Farmers' Bulletin No. 52, containing directions for planting and cultivating the crop, were sent to every person directly interested in the experiments, as well as to many others.

The promiscuous method of investigation which has been practiced during this and preceding years is faulty and unsatisfactory. In former reports the objections to such investigations have been outlined. In Bulletin No. 27 of this division (on pages 6, 7, and 8) is found a number of statements relating to the general conduct of experimental work, which are still pertinent. Inasmuch as this bulletin is out of print, it will be found of interest to repeat these statements here:

It must be understood that the object of this bulletin is not to give a complete treatise upon the culture of the sugar beet and the manufacture of sugar therefrom, but simply to indicate, for the information of those interested, the general principles of this industry. One especial object which will be kept in view is to prevent those intending to engage in this industry from going wrong in the beginning and squandering their money and time in battling with problems which science has already met and overcome. It is further hoped that the careful study of the data presented will prevent any mistakes from being made which would end in financial disaster and which are so apt to attend the early history of every industry.

There will probably be found for many years to come in the United States more enthusiasm than knowledge connected with the sugar beet, and the result of this will be, unless great care is taken, that many ventures will be made which may result in financial disaster, disaster which could have been avoided by a thorough comprehension of the fundamental principles of the industry.

In so far as the manufacture of sugar from the matured beet is concerned, we are able to start at the present time with the accumulated knowledge and experience of three-quarters of a century of investigation. So perfect have the processes of manufacture become that nearly all of the sugar which is stored in the beet can be secured in merchantable form and by comparatively inexpensive methods. By the term inexpensive, however, it must be understood that the actual processes of manufacture are denoted and not the cost of the machinery. The various processes for the extraction of the sugar from the beet, the best methods of clarifying the juice and of evaporating it and for separating the sugar from the molasses, are thoroughly

well understood and are no longer legitimate subjects for public experiment. The great problem in this country is the agricultural one. The selection of suitable soil, the finding of the proper climatic conditions, and instruction in the method of planting, cultivating, and harvesting the beets, are all matters of vital importance. Without a careful study of these subjects, and without the proper knowledge thereof, it is a hopeless task to attempt to introduce successfully the beet-sugar industry into this country.

One of the great dangers to be avoided is the formation of hasty conclusions in regard to the proper localities for the production of the sugar beet. Often without any study whatever of the climatic conditions or of the character of the soil, efforts are made to build large and expensive factories, which as often have to be abandoned on account of having been wrongly located. The studies which have been made heretofore in regard to climatic conditions have been of such a nature as to locate, in a general way, the areas in the United States suitable for the culture of the sugar beet.

It has been found in general that the coast valleys of California, and probably large areas in Oregon and Washington, certain parts of the Dakotas and Nebraska, localities in Minnesota, Iowa, Wisconsin, and Michigan, parts of northern Illinois, Indiana, Ohio, and New York present favorable conditions for sugar-beet culture; but in the regions thus broadly intimated there are certain restricted areas most suitable to the sugar beet, and it is only these restricted areas to which we must look for success. The fact that in one locality, for instance in Nebraska, good sugar beets can be produced would be no warrant whatever for assuming that all parts of that State were equally suitable for this purpose, and this remark may be applied to every one of the States mentioned above.

Sugar beets have also been raised in other sections in the United States, notably in New England, New Jersey, Delaware, and Kansas, and while there may be areas in the New England States where beets can be successfully grown, it must be admitted that the States last named stand in the second rank of beet-sugar producing localities. In Kansas, during the last year, as will be shown in the body of this report, sugar beets were grown and a considerable quantity of sugar manufactured therefrom. This, however, does not show that Kansas will be able to compete with more favorable States in the production of beet sugar.

In general, it may be said that the summers in Kansas are too hot to expect the production of a sugar beet uniform in its nature and containing a high percentage of sugar.

If the sugar-beet industry is to succeed in this country, the success must come from sharp competition with the same industry in older countries, where its conditions are better understood and where the localities suited to it have been selected by long and often costly experience. It must also compete with the sugar-cane industry, both of this country and of tropical countries, and for this reason we can only expect it to survive in those regions where soil and climatic conditions, proximity to fuel, cheapness of labor, and other favorable environments are found.

It is to be hoped that the mistakes which have so long threatened the sorghum-sugar industry with destruction may be avoided with the sugar beet. Calm judgment and sober reason must not give way to enthusiasm and extravagant expectations. All conditions of success must be carefully studied, all the difficulties in the way of success must be intimately investigated and surmounted, and ample capital, coupled with judicious perseverance, must be enlisted in its behalf.

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For the proper erection and completion of a beet-sugar factory not less than twelve months should be allowed, and even in this time it can only be properly accomplished under experienced technical control.

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In Bulletin No. 30 (on page 7) the following observations are found:

Only in a few instances were the directions of the Department followed out to the letter. In most cases the planting and cultivation of the beet seed were conducted according to such methods as the agriculturist might hit upon at the time. From the information gathered it was found that the chief variation from the instructions was in the preparation of the soil. In very few cases was a subsoil plow used and most of the beets which were sent to the Department were evidently grown in soil of insufficient depth. In some cases, where the exact directions for cultivation were carried out, the character of the beets received showed by contrast with the others the absolute necessity of employing the best methods of agriculture for their production.

In Bulletin No. 33 (on page 9) the following statement is made:

One of the most striking features in regard to this method of conducting experimental work is found in the fact that it is almost impossible to secure compliance with directions. It is evident, at once, that the value of experimental work depends upon the care with which it is done and the accuracy with which the directions prescribed are followed. It is not to be wondered at that farmers, busy with their other occupations, failed to comply with the minute directions necessary to secure the greatest advantage in experimental work.

Very few of the blanks were returned properly filled out. In many cases the data which were returned were palpably erroneous. In one instance a yield of 99 tons per acre was reported, and in a great many cases the reported yield per acre was so great as to show inaccuracy on the part of the measurement of the land or the weighing of the beets. In making out returns for such reported phenomenal yields the theoretical quantity of sugar per acre given was always questioned. We are accustomed to look with suspicion upon any yield of sugar beets which exceeds 25 tons per acre. While it is not impossible to secure a higher yield than this, and of beets of good saccharine quality, yet it is so rare as to throw doubt upon miscellaneous data showing an excess of that yield.

Another point, which makes the returns obtained less valuable, is found in the fact of the length of time which necessarily elapsed between the harvesting of the beets and their reception at the laboratory. Nearly all the samples received were from distant States, requiring for packages of this kind from three to eight days in the mails. Although the beets were in most cases well wrapped, according to directions, our experiments have shown that they must have lost a considerable quantity of moisture by evaporation during their long transit. The data, therefore, showing the content of sugar in the juice would be uniformly too high for normal beets. It is estimated that not less than 10 per cent should be subtracted from the number for sugar to express the normal percentage of sugar in the beets as originally harvested.

In Bulletin No. 36 (on page 28) the ideas outlined above are somewhat expanded in the following words:

Before proceeding to discuss the data in the preceding tables, attention should be called to the fact that in previous reports of this kind some dissatisfaction has been expressed in some States on account of the poor showing of the samples therefrom. In former reports attention has been particularly called to the probability that the data obtained by this method of experimentation are not wholly reliable and in all cases do not truly represent the capabilities of any locality for beet-sugar production. It is true that a large number of data received from a given State will indicate, in a general way, whether or not that State is capable of producing a good sugar beet, but where the number of data is limited, it may be that the agricultural conditions under which the samples were produced were so poor, or the season so exceptional, as to prevent a fair judgment of the capabilities of the soil and climate. On the

other hand, the culture which the samples received may have been so careful and the seasonal conditions so favorable as to produce a beet far above the average which could be produced in the whole State.

Again, the loss of moisture during transportation, or the failure of the farmers to send their beets in as soon as harvested, may tend to reduce the amount of water present in the beet and to raise correspondingly the quantity of sugar therein. Inasmuch as the analyses are made on the expressed juice, this would tend to show always an increased amount of sugar over that present naturally in the beets.

All these disturbing influences must be taken into consideration in judging the data which have been recorded. This has been said in general explanation so as to forestall any criticisms which may be made of the value of the data obtained.

To illustrate more particularly what is meant, attention is called to the instance, say, of Colorado and Montana. From the State of Colorado one hundred and twenty-three samples were received for analysis, and from the State of Montana only one sample. Any comparison, therefore, between the average results of the two States would be simply absurd. While one hundred and twenty-three samples from Colorado, showing, as they do, fine possibilities of sugar-beet culture, indicate that the State of Colorado is capable of producing beets of high quality, the single sample from Montana, whether it proved exceptionally poor or exceptionally fine, could have been no criterion by which the capabilities of the State for beet sugar could be judged.

In connection with the tentative results which have been obtained by this kind of work should be considered the characteristics of the soil and climate of each locality, and by putting the two together a fairly good idea can be formed of the possibilities of beet-sugar production. The reader should carefully bear the above explanation in mind, both in looking over the data in the tables and in reading the remarks thereon which follow.

In Bulletin No. 39 (on page 8) in commenting on the results of the year's work, the following statements are made:

The general results of the work this year are somewhat discouraging as compared with previous years. Throughout a great part of the beet-growing region the summer was excessively dry, and large numbers of total failures were reported.

In former reports attention has been called to the fact that the present method of experiment is unsatisfactory, and the reasons therefor have been fully set forth. The farmers are so busy with other work that, as a rule, they are not able to give careful attention to the experimental details. They do not have the time to suitably prepare the soil for beet culture, nor do they give the growing beet proper attention. When the time for harvesting comes they are usually engaged in other farm work, so that the beets are not harvested at the right time, nor are data obtained by means of which any accurate estimate of the yield per acre can be determined. The analytical data, therefore, of such work are usually fragmentary and far from teaching any definite lesson in regard to the industry itself. In general, however, the data bear out those of previous years in showing the areas in this country where the best beets can be grown. It is in these regions that the development of the industry must be expected.

There is probably not a State or Territory in the Union which is not capable of growing a fair article of sugar beets. Even in the far South beets of fair sugar content have been produced, and with good tonnage; but when the competition of the world is to be met, with the price of sugar as low as it is now, only those parts of the country where the soil and climate are especially favorable can be expected to compete successfully with the beet-sugar industry already firmly established in older countries. The sole valuable lesson, therefore, of the promiscuous distribution of beet seed is in the fact that, as a rule, those regions best suited to the growth of the sugar beet will gradually be outlined, and intending investors led to the proper localities for the establishment of factories.

The great success of the beet-sugar industry on the Pacific coast leads to the conclusion that if the northern part of the eastern and central portions of our country is to become the seat of a great sugar industry, every possible advantage must be taken of soil and location, in order to compete successfully with the beet fields of California, Washington, and Oregon.

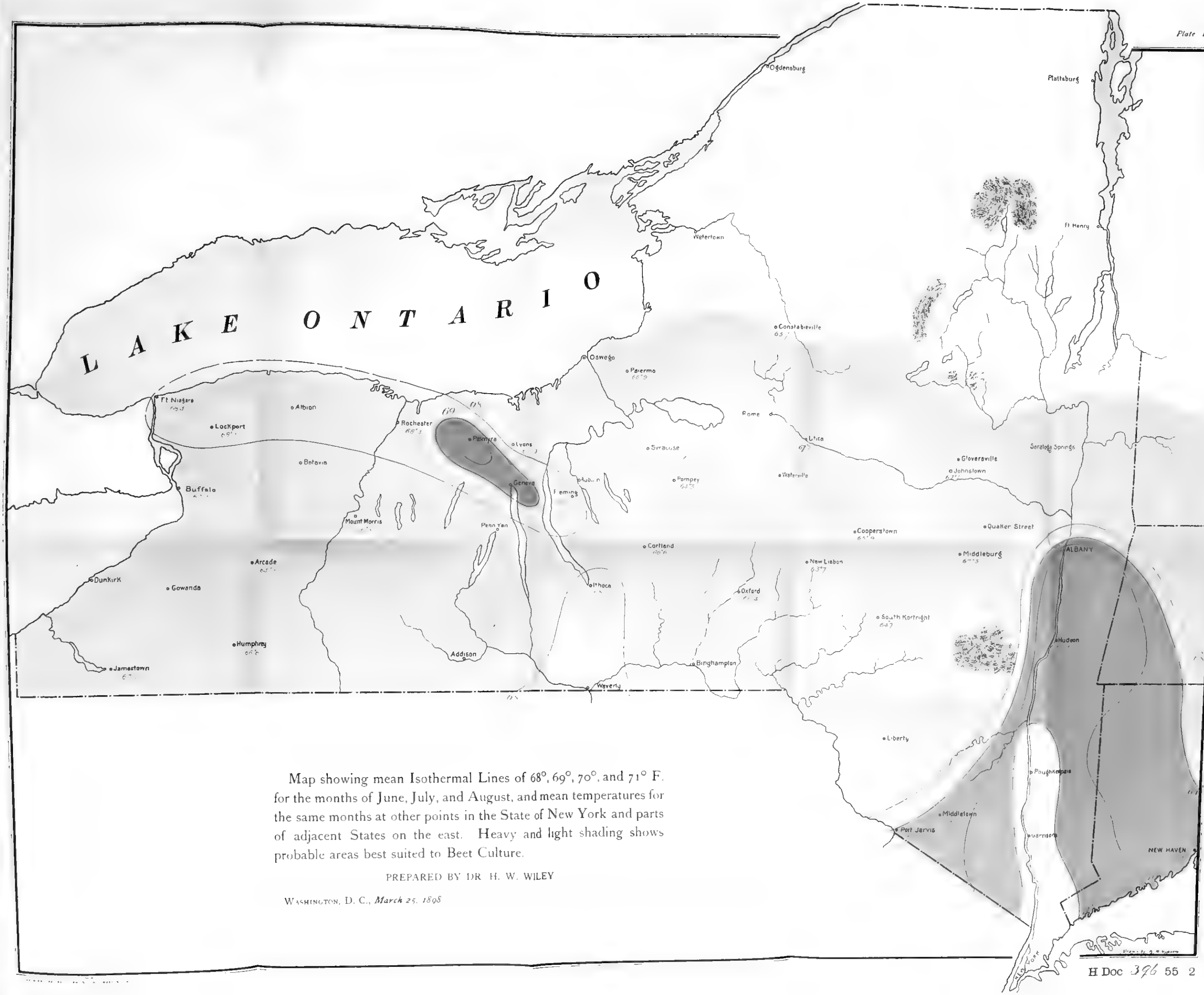
The experience of the past season, as will be seen from the data in the following pages, has served only to give additional point to the observations made in previous bulletins.

The sugar-beet industry in this country has now reached a point where it is incumbent upon the National Government to secure a complete and accurate agricultural survey of the country in respect of growing beets. The competition in sugar making is now so keen that only those localities where natural conditions are best will, in the end, be found sustaining the industry. If we depend upon costly experiment to delimit these localities, hundreds of thousands of dollars will be wasted in the attempt. At a comparatively small expense, the Department of Agriculture will be able to have made careful and accurate surveys, based upon experimental data, to point out the regions where the sugar industry is most likely to succeed. This, however, can not be done by the promiscuous kind of experimentation which the Department has been compelled heretofore to pursue. Up to this time a sufficient scientific interest in the matter has not been aroused among the people to secure the kind of a survey which is necessary. Now, however, the conditions have changed. The agricultural experiment stations in most of the States are thoroughly aroused in this matter. They are willing, with the cooperation of the Department, to undertake an agricultural survey of their respective localities. In addition to this, intelligent men, either in their capacity of private citizens or as representatives of boards of trade, or of business men's associations, are ready to supervise, in limited districts, series of experiments which will give satisfactory answers to the questions which must be answered before the sugar-beet industry is fully established. It will therefore be the object of the Department in subsequent work, especially that of 1898, to secure in each locality interested in the matter, a few carefully conducted experiments. To this end it is urged that the experiment stations in the various States arrange with 25, 50, 100, or more representative farmers, who can be relied upon to do good work, to grow plats of beets in size of not less than half an acre.

CLIMATOLOGY.

It is evident that one of the first things to be considered, after the soil itself, in connection with the sugar-beet industry is the climate. The sugar beet is a plant very susceptible to climatic conditions. At the beginning of its growth the beet plant is peculiarly helpless. It can not lift, in passing from the germ to the new plant, the lightest clod. A rain which packs the surface of the soil immediately after germination will sometimes prevent the plant from reaching the light.

After the plant is established it requires a considerable quantity of water for its proper growth; this water must be supplied either by the rainfall of the locality, by irrigation, or by the subsoil. High temperatures extending over long periods of time are peculiarly injurious to the storing of sugar in the tuber. While high temperatures may not diminish the tonnage yielded by a field, nor apparently produce any injurious effects, in so far as the external appearance of the mature plant is concerned, it will be found, as a rule, that plants grown under such conditions of temperature are less rich in sugar than others grown in a milder climate. Since the production of sugar in the leaf of a plant is a joint function of the chlorophyll cells and sunlight, it is found that the high northern latitudes, where the summer days are exceptionally long and the nights correspondingly short, tend to produce, other conditions being the same, a beet rich in sugar. The climatic conditions of this country are so different from those of Europe as to render of little value the general conclusions which experience has drawn from the effect of climate, in the beet-sugar producing countries of Europe, on the sugar content of the beet itself. Nevertheless, it is seen that in Europe the great centers of the beet-sugar industry are in regions far to the north, in fact, so far north as to make it impracticable ever to expect, in this country, to establish the centers of the industry on the same parallels of latitude. When it is considered for a moment that the great capitals of Europe—St. Petersburg, London, and Berlin—are situated 1,460, 870, and 940 miles, respectively, north of Washington, and yet in prosperous agricultural communities the above statement does not create surprise. The vicissitudes of climatic conditions in northern Europe are also less marked than they are in the United States. Throughout the beet-growing area of Europe it is expected that the summers will be mild. They are not attended with many days of excessive heat. Spring comes early and permanently; the autumn comes slowly and late. In France and Belgium a severe frost is not expected in May, nor is it anticipated that ice of a considerable thickness will form in October. The summer days in these localities are considerably longer than even in the more northern portions of our country, and at least an hour longer than in the centers of our greatest agricultural prosperity. We find, therefore, so great a deviation in their climatic conditions that we can not apply with rigidity in this country the rules respecting the climate deduced from the experience of European countries. With those rules applicable in this country, it would be easily demonstrable that the great center of the sugar-beet industry on this continent would be in Canada, and not in the United States. We have, therefore, had to depend so far largely on theory in the application of the principles of climatology in the culture of the sugar beet in the United States. The experimental data which have been at our disposal have been fragmentary, and, as has already been noted, have not been secured in the systematic way desirable. The result is, even to-day, that many of our theories



Map showing mean Isothermal Lines of 68°, 69°, 70°, and 71° F. for the months of June, July, and August, and mean temperatures for the same months at other points in the State of New York and parts of adjacent States on the east. Heavy and light shading shows probable areas best suited to Beet Culture.

PREPARED BY DR. H. W. WILEY

WASHINGTON, D. C., *March 25, 1898*

CORRECTIONS.

For Plate I read Plate II.
For Plate II read Plate I.

in regard to climate are not yet substantiated by facts. In the light of the data at hand, in the publication of previous reports it has been assumed that the beet-sugar zone of the United States would be found located over an area of which the southern limit would be marked by the mean isotherm of 71° F. for the summer months of June, July, and August. While this temperature is considerably higher than the mean temperature of the European beet-sugar areas for the same period of time, it has always been evident that the beet area of the United States would necessarily be situated farther south than the like area of Europe. There are two reasons which make this location imperative. In the first place, the more northern latitudes not only have late springs, but even after the spring is once established the occurrence of a heavy frost is not unusual. In the second place, these same latitudes have short autumns, and the occurrence of heavy frosts in late October or early November are not at all unexpected. As a result of this, the season for the growth and harvest of the beet is too short if we should apply for the mean summer temperature the same rules as obtain in Europe. It is evident, however, that the assumption of the mean isotherm of 71° for June, July, and August as the southern limit of the beet-sugar area is based upon so many independent conditions as to render it only useful as a working basis.

OTHER CONDITIONS.

In connection with the temperature must be considered the rainfall, the contour and the nature of the soil, the possibility of irrigation, the abundance of subsoil moisture, the proximity of coal, limestone, and water, price of labor, facilities for distribution and transportation, and many other matters which are important in a discussion of the subject. It is further evident that the tracing of a single isothermal line and the arbitrary addition thereto of a certain width of land on either side do not give even the proper theoretical thermal basis for a careful study of climatic conditions.

MAP OF THERMAL BELT.

For this reason, the present report is supplied with a new map (Plate I), which has been kindly prepared by the Weather Bureau at our request, in which the isothermal lines for June, July, and August have been traced with greater care and from data extending over a longer period of time.[1]

The result of these new studies has been to change from former maps, in some cases slightly and in some cases considerably, the position of the mean isotherm of 70° for the three summer months named. This change, as will be seen by consulting the new map, is most marked in

[1] Data supplied, through the courtesy of Mr. Willis S. Moore, chief of the Weather Bureau, by Mr. A. J. Henry. The map was drawn by the draftsmen of the Bureau under Mr. Henry's direction.

the case of the State of New York, where in former maps the mean isotherm of 70° was traced in a line running almost directly west from Albany to Buffalo.

CHANGES IN THE NEW MAP.

In the new map the influence of the Allegheny Mountains on temperature has been more carefully studied, and as a result there has been a considerable deflection of the isotherm of 70° to the south and southwest. The general trend of this isotherm from Albany is in a southwesterly direction until the Allegheny Mountains are crossed, where it turns in a westerly direction until it reaches its former location practically in the neighborhood of Cleveland, Ohio. The position of this isotherm from this point westward is so nearly the same as that of the other map as to require no particular mention. The State of New York, however, especially that portion of it lying between Albany and Buffalo, has peculiar thermal conditions, and these are shown in a special map of that State (Pl. II). A considerable area of the State with a mean summer temperature of 70° is found in the northwestern part in the neighborhood of Rochester, while between this area and the continuous isotherm of 70°, as traced upon the map, is a considerable space of territory where the mean summer temperature is considerably below 70°. This area, however, corresponds more nearly to the beet areas of northern Europe than any other portions of our country. The temperature and other climatic conditions in this area are more uniform by reason of the modifying effects of the Great Lakes on the winds which blow from the west and northwest. The experimental data which have been collected show, therefore, that this area, although in many cases the mean summer temperature is below 70°, is peculiarly suited to the production of beets of a high sugar content. The comparatively mild springs and autumns also favor the planting and harvesting of the beet, so that the conditions of this area are as favorable to the production of beets of the proper grade as those areas lying immediately contiguous to the mean isotherm of 70°.

TRIPLE ISOTHERMAL LINES.

As a single isothermal line passing across the country affords a very narrow basis for study, it has been deemed advisable in the map herewith presented to take as the nucleus of the isothermic sugar zone not merely the isotherm of 70°, but that belt of territory, varying in width, which is bounded by the isotherms of 69° upon the north and 71° upon the south. The isotherm of 70° is found between these two, usually occupying the center of the belt, or nearly so, but sometimes approaching more nearly the one or the other. If, now, we add to the outside of the belt of irregular width, thus outlined by the two isotherms mentioned, on the south a strip of country of varying width and on the north an area bounded by the limit of dangerous frosts, this area will

MAP SHOWING THE PROBABLE AREAS SUITED TO BEET CULTURE.

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practically include the whole of the United States which, from theoretical conditions of temperature, is best suited to the growth of sugar beets of a high saccharine content.

BEET ZONE.

The shaded portions of the map herewith presented indicate in a general way this area. No attempt has been made to extend this lateral shading west of the Missouri River. The paucity of data for the western part of the country, in connection with the extreme vicissitudes of climate, renders of little value any extension of the thermal belt.

ANNUAL RAINFALL.

Connected with this study, the annual precipitation is of the utmost importance. There has therefore been marked upon the map, in the area covered by this belt, the mean precipitation, in inches, from 50 to 40, from 40 to 30, and so on down to the least recorded quantities of rainfall in the far western arid regions.

The mean annual precipitation is, of course, of importance in determining the relations of the different regions to the water supply and the need of irrigation. It is also important to know the mean precipitation for the months during which the chief growth of the crop and the harvest take place, namely, for April, May, June, July, August, September, and October. The mean precipitation for each of these three months, as furnished by the Weather Bureau for the localities mentioned, is indicated in the following tables:

Monthly averages of rainfall, April–October.

Stations.	Latitude.	Longitude.	Elevation.	Number of years.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
MASSACHUSETTS.	° ′	° ′										
Amherst	42 22	72 32	235	61	3.1	3.9	3.7	4.5	4.4	3.4	3.9	26.9
Boston	42 21	71 04	12	79	3.8	3.7	3.2	3.6	4.3	3.4	3.8	25.8
Fall River	41 42	71 09	259	22	3.9	4.0	3.1	3.5	4.4	3.3	4.5	26.7
Fitchburg	42 36	71 50	433	32	2.9	3.8	3.3	3.7	4.3	3.2	4.1	25.3
Lowell	42 39	71 17	104	42	3.6	3.7	3.3	3.8	4.4	3.3	3.8	25.9
New Bedford	41 39	70 56	100	83	3.6	3.8	3.0	3.1	3.9	3.3	3.7	24.4
Springfield	42 05	72 35	70	47	3.2	4.2	3.8	4.5	4.5	3.4	4.2	27.8
Taunton	41 54	71 05	30	22	3.6	3.3	2.5	3.5	4.2	2.8	3.8	23.7
Worcester	42 16	71 49	473	43	3.7	4.1	3.1	3.8	4.5	3.5	4.4	27.1
CONNECTICUT.												
Hartford	41 45	72 40	38	27	3.0	3.6	3.0	4.1	4.6	3.2	3.9	25.4
New Haven	41 18	72 56	10	45	3.3	3.9	3.1	4.5	4.6	3.8	3.8	27.0
New London	41 21	72 05	8	26	3.7	3.6	3.2	4.0	4.7	3.4	4.4	27.0
Middletown	41 33	72 39	37	33	3.4	3.8	3.5	4.3	4.8	3.6	4.1	27.5
Southington	41 35	72 51	152	26	3.1	3.2	2.8	3.9	4.6	2.9	3.6	24.1
Wallingford	41 27	72 49	73	35	3.6	4.2	3.6	4.2	5.0	3.6	4.2	28.4
NEW YORK.												
Albany	42 40	73 45	32	69	2.8	3.6	4.1	4.2	4.0	3.5	3.5	25.7
Buffalo	42 53	78 53	587	27	2.5	3.4	3.5	3.2	3.2	3.3	3.6	22.7
Cooperstown	42 42	74 57	1,300	43	2.6	3.6	4.1	4.3	4.1	3.4	3.3	25.4
Gouverneur	44 25	75 35	423	21	2.1	2.7	2.7	2.8	2.3	3.1	3.4	19.1
Ithaca	42 27	76 30	375	36	2.2	3.4	3.7	3.5	3.0	3.0	2.9	21.7
New York City	40 43	73 58	52	61	3.4	4.0	3.8	4.0	4.7	3.4	3.6	26.9
North Salem	41 20	73 34	361	23	3.4	4.4	3.5	4.0	4.1	3.1	4.1	26.6

Monthly averages of rainfall, April-October—Continued.

Sections.	Latitude.	Longitude.	Elevation.	Number of years.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
NEW YORK—cont'd.	° ′	° ′										
Oswego	43 29	76 35	335	26	2.1	2.8	3.4	3.1	2.6	2.8	3.3	20.1
Palermo	43 20	76 22	......	42	2.3	2.8	3.3	3.3	2.7	3.2	3.4	21.0
Rochester	43 08	77 42	494	27	2.5	3.3	3.3	3.0	3.0	2.4	2.9	20.4
Utica	43 06	75 13	473	41	2.7	3.5	4.3	4.7	3.5	3.5	3.5	25.7
NEW JERSEY.												
Atlantic City	39 22	74 25	13	23	3.3	3.1	3.0	3.5	4.3	3.2	3.2	23.6
Lambertville	40 23	74 57	75	25	3.3	4.4	3.8	4.4	4.9	4.3	3.6	28.7
Newark	40 45	74 10	13	52	3.5	4.0	3.5	4.4	5.0	3.8	3.6	27.8
New Brunswick	40 30	74 27	48	43	3.7	3.9	3.9	4.7	4.9	3.8	3.4	28.3
South Orange	40 45	74 15	141	26	3.3	3.2	3.6	4.9	5.2	4.0	3.7	27.9
Trenton	40 14	74 45	33	24	3.7	4.1	3.9	5.5	5.3	4.0	4.0	30.5
Vineland	39 29	75 01	97	25	3.3	3.9	3.3	4.3	4.9	4.0	3.4	27.1
PENNSYLVANIA.												
Blooming Grove	41 23	75 09	......	25	3.2	4.0	4.1	5.0	4.9	3.1	3.6	27.9
Dyberry	41 38	75 18	1,100	25	2.5	3.4	3.1	4.6	3.8	2.8	3.3	23.5
Erie	42 07	80 05	686	23	2.5	3.8	3.9	2.8	3.3	4.0	4.1	24.4
Gettysburg	39 49	77 15	624	24	3.5	4.0	3.5	3.4	3.6	3.0	3.1	24.1
Harrisburg	40 16	76 53	320	25	3.0	4.6	4.4	4.2	3.9	3.6	3.3	27.0
Pittsburg	40 22	79 59	745	54	3.0	3.5	3.6	4.0	3.4	2.9	2.8	23.2
Philadelphia	39 53	75 10	32	72	3.4	3.8	3.8	4.0	4.3	3.5	3.2	26.0
MARYLAND.												
Baltimore	39 17	76 37	68	26	3.4	3.8	4.0	4.7	4.0	3.9	2.9	26.7
Cumberland	39 39	78 45	639	24	2.5	3.4	3.8	3.4	3.2	2.8	2.3	21.4
Emmitsburg	39 43	77 20	498	12	3.5	4.6	3.9	3.4	3.3	3.8	3.8	26.3
Frederick	39 24	77 24	415	15	3.7	4.4	4.6	3.5	2.7	3.7	2.5	25.1
OHIO.												
Cleveland	41 30	81 42	582	41	2.7	3.5	3.9	3.4	3.1	3.6	2.8	23.0
Columbus	39 58	83 00	812	17	3.2	4.2	3.5	3.2	3.2	2.6	2.6	22.5
Marietta	39 30	81 26	611	69	3.3	3.9	4.1	4.4	3.9	3.1	3.1	25.8
North Lewisburg	40 11	83 35	1,030	25	3.1	3.9	4.0	4.4	3.3	3.2	2.2	24.1
Steubenville	40 25	80 41	663	39	3.4	3.9	4.0	4.0	3.9	3.5	3.1	25.8
Toledo	41 40	83 34	579	26	2.2	3.4	3.4	3.1	2.7	2.4	2.4	19.6
Wauseon	41 36	84 07	767	23	3.0	4.2	4.1	3.4	2.7	2.6	2.6	22.6
Westerville	40 04	82 46	850	35	3.0	3.4	3.8	3.9	3.3	3.1	2.1	22.6
INDIANA.												
Angola	41 36	85 00	1,052	11	2.9	4.5	3.7	2.7	2.7	3.8	2.3	22.6
Columbia City	41 09	85 30	863	16	3.4	4.5	4.1	3.2	2.7	3.9	1.9	23.7
Connersville	39 40	85 03	844	14	3.7	4.4	4.3	2.4	2.7	2.6	2.2	22.3
Farmland	40 11	85 10	1,040	14	3.4	4.7	4.0	2.8	3.5	3.6	2.0	24.0
Fort Wayne	41 05	85 07	815	13	3.2	3.9	3.8	4.9	3.4	3.2	3.0	25.4
Indianapolis	39 46	86 10	753	27	3.6	4.0	4.5	4.2	3.3	3.1	2.8	25.5
Lafayette	40 28	86 54	667	16	3.7	4.8	4.2	3.7	3.5	2.7	2.2	24.8
Logansport	40 45	86 22	586	19	3.5	5.0	4.2	2.9	2.9	3.1	2.5	24.1
Mauzy	39 37	85 23	......	13	3.5	4.2	4.5	2.2	2.7	3.1	2.5	22.7
Richmond	39 51	84 53	850	26	3.6	4.3	3.9	3.5	3.9	4.1	2.8	26.1
Spiceland	39 48	85 18	1,063	28	2.9	3.8	4.4	4.1	3.3	3.1	2.2	23.8
Wabash	40 48	85 49	698	10	2.9	4.2	4.6	3.4	3.0	2.5	3.6	24.2
ILLINOIS.												
Athens	39 57	89 45	800	16	4.1	4.8	5.7	3.4	3.0	3.3	2.5	26.8
Augusta	40 12	90 57	674	19	4.0	4.1	4.1	4.8	3.6	4.1	2.9	27.6
Aurora	41 47	88 08	648	22	3.2	4.0	3.8	3.3	3.4	3.2	2.9	23.8
Chicago	41 52	87 38	589	30	3.0	3.7	3.7	3.4	2.9	3.0	2.7	22.4
Elmira	41 10	89 49	505	17	3.2	4.1	4.1	3.2	3.6	3.3	2.1	23.6
Galesburg	40 56	90 22	786	12	2.9	3.5	4.0	3.7	4.2	4.1	2.6	25.0
Geneseo	41 27	90 06	845	11	2.7	3.1	3.8	2.9	3.0	3.6	2.7	21.8
Havana	40 18	90 05	475	11	3.5	3.6	4.2	4.6	2.5	3.8	2.2	24.4
Hennepin	41 16	89 21	......	13	3.0	3.7	4.1	3.0	2.8	2.6	2.7	21.9
Marengo	42 15	88 37	819	45	2.8	3.9	4.3	3.7	3.7	3.8	2.4	24.6
Mattoon	39 29	88 24	737	15	4.2	5.0	4.8	3.9	3.4	2.9	2.8	27.0
Oswego	41 40	88 22	670	16	3.0	3.9	4.0	3.1	3.0	2.8	2.8	22.6
Ottawa	41 22	88 48	688	25	2.9	4.0	3.6	3.6	2.9	2.9	2.3	22.2
Peoria	40 42	89 36	452	41	3.2	3.8	3.7	4.0	3.0	3.5	2.5	23.7
Philo	39 59	88 08	771	11	3.8	4.2	4.2	2.7	2.1	3.3	1.7	22.0
Pontiac	40 54	88 40	600	6	2.2	3.2	3.2	2.2	1.5	1.7	1.5	15.5
Rockford	42 15	89 05	730	22	3.3	4.0	4.8	3.6	3.2	2.4	3.2	24.5
Rock Island Arsenal	41 32	90 38	528	14	2.7	3.9	3.9	3.7	3.3	3.2	1.6	22.3
Sandwich	41 31	88 32	656	17	3.7	4.6	4.3	4.5	4.5	3.5	2.5	27.6

Monthly averages of rainfall, April–October—Continued.

Sections.	Latitude.	Longitude.	Elevation.	Number of years.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
ILLINOIS—continued.	° ′	° ′										
Springfield	39 48	89 39	614	17	3.7	5.0	4.4	2.8	2.4	3.2	2.7	24.2
Sycamore	42 00	88 42	800	15	3.6	4.3	5.0	3.6	2.9	3.0	3.1	25.5
Watseka	40 48	87 45	640	7	3.7	5.6	3.7	3.0	2.4	2.9	2.6	23.9
Winnebago	42 17	89 12	861	18	3.2	4.0	4.1	3.5	3.2	3.6	2.3	23.9
Wyanet	41 30	89 45	750	11	3.8	4.6	4.5	4.2	4.7	4.8	2.4	29.0
WISCONSIN.												
Beloit	42 30	89 11	741	30	2.9	3.2	4.0	3.5	3.6	3.4	2.5	23.1
La Crosse	43 49	91 15	657	24	2.4	3.3	4.5	4.0	3.2	4.2	2.3	23.9
Madison	43 05	89 24	857	28	2.6	3.5	4.5	4.0	3.1	3.1	2.6	23.4
Manitowoc	44 07	87 46	593	33	2.4	2.6	3.6	3.5	3.2	3.0	2.6	20.9
Milwaukee	43 02	87 54	591	53	2.8	3.4	3.8	3.2	2.7	3.0	2.2	21.1
MICHIGAN.												
Detroit	42 20	83 03	580	46	2.6	3.1	3.8	3.6	2.6	3.0	2.6	21.3
Grand Haven	43 05	86 18	593	25	2.6	3.4	3.8	2.8	2.7	3.6	3.2	22.1
Grand Rapids	42 57	85 40	604	14	2.8	3.6	4.2	2.4	2.4	3.4	2.5	21.3
Kalamazoo	42 20	85 38	770	20	2.6	4.4	4.5	3.2	2.6	3.2	2.8	23.3
Lansing	42 44	84 32	836	33	2.4	3.4	4.0	3.1	2.7	2.9	2.5	21.0
Port Huron	43 00	82 26	584	22	2.1	3.4	3.5	2.4	2.6	2.6	2.8	19.4

STUDY OF PARTICULAR LOCALITIES.

North Carolina and West Virginia.

The elevated areas of the mountain regions of North Carolina and West Virginia afford conditions of temperature and precipitation which are favorable to the growth of sugar beets. The rough and mountainous character of this portion of the country, however, presents mechanical difficulties in cultivation of sufficient magnitude to warrant the statement that the beet industry on a large scale is not likely to be established within it. A portion of the region specified has a mean annual rainfall of more than 50 inches, while the most of it is supplied with a rainfall of 46 inches. It is not probable, on account of the consideration mentioned above, that the beet-sugar industry, on a scale of any magnitude, will ever be established in the regions specified.

Eastern Shore of Maryland.

The isotherm of 71° enters Maryland at a point about the center of the Atlantic coast of the eastern shore, and runs north by northeast almost to Poughkeepsie, N. Y. It is evident, therefore, that the temperature conditions of this region are similar to those on or south of the isotherm of 71° in other parts of the country, although here in this area the region lies to the west of this isotherm. Judged by this factor, and also by the mean annual rainfall, which is 40 inches for this locality, the cultivation of the sugar beet might be successfully inaugurated along the Atlantic coast of the eastern shore; in fact, practically over the whole of the southern portion of the eastern shore of Maryland. The character of the soil in this locality is mostly sandy, and its natural fertility has been considerably diminished by long years

of cultivation. There is no reason to doubt, however, the fact that with proper fertilization and cultivation the requisite degree of fertility for the production of sugar beets could be secured. The general tendency in this region is in the direction of a too high temperature and too few hours of sunshine. The above observations apply also to Accomac County, Va.

Delaware.

The observations which have been made in regard to the eastern shore of Maryland also apply to the eastern region of Delaware. On account of the ravages of the "yellows" among the peach orchards of southern Delaware, it might be worth while for the agricultural experiment station to make a careful survey of the southeastern portion of the State with reference to the possibility of producing sugar beets of the requisite degree of saccharine strength. The surface of the soil is generally level; a good deal of it is of a sandy nature, and so far as its physical properties are concerned, it may be regarded as favorable to beet growth.

New Jersey.

The mean isotherm of 71° degrees passes northward almost parallel to the Atlantic coast of New Jersey, and at varying distances therefrom. The part of New Jersey lying between this isotherm and the seacoast is mostly composed of sandy soils, reasonably level. There are no mechanical difficulties of any magnitude connected with the culture of the beet, and the problem of fertilization of the soil is one which is easily solved. The same observations in regard to possibilities of beet culture may be made of this region of New Jersey as have been made in respect of Maryland and Delaware. This general observation relating to the whole may be added:

We have in this area a mean summer temperature of 71°. In no place does it reach the isotherm of 70°. The whole region may therefore be regarded as representing that of a maximum temperature compatible with beet culture. It may be further said that the culture of the beet should only be pushed south and beyond the isotherm of 71°, where peculiar natural advantages, independent of thermal factors, are afforded. These natural advantages consist of exceptionally fertile soil, favorable contour of the surface, cheapness of fuel, facilities for transportation, etc. A large portion of the region which has been mentioned is devoted to truck farming for the markets of large cities, and it is doubtful if this remunerative form of agriculture could be replaced successfully with sugar-beet culture in competition with more northern localities, where richer beets can be produced. Nevertheless, the possible production of fairly good beets in the region indicated must be admitted from the point of view of temperature and precipitation alone.

CONNECTICUT.

It will be observed that, both in respect of precipitation and temperature, the whole of Connecticut may be regarded as lying in the beet belt. From theoretical considerations, therefore, it could be predicted that beets grown in Connecticut would show a satisfactory content of sugar and possess a high purity. So favorable are the theoretical conditions in that locality that it would be advisable for the agricultural experiment stations of the State to make a systematic agricultural survey of the possibilities of growing beets. The valley of the Connecticut River affords a fertile field of experiment where the mechanical conditions of culture and the natural conditions of the soil are factors which favor success. There are large areas of the State, however, so broken in contour as to render the possibilities of beet culture unpromising, but wherever large bodies of fairly level land with good fertility can be found it is fair to presume that the culture of the sugar beet would be attended with success. Conditions which obtain in Connecticut are also found in the State of Rhode Island, although a portion of that State lies north of the isotherm of 69°. As will be seen farther along, however, in discussing the conditions of growth in New York, there are many localities in the United States north of the isotherm of 69° where beets flourish; in fact, it may be said that the possibilities of growing beets north of the isotherm of 69°, where reasonably mild autumns can be expected, are much better than south of the isotherm of 71°.

MASSACHUSETTS.

The valley of the Connecticut, in the State of Massachusetts, doubtless affords as fine facilities for beet culture as in the State of Connecticut. The greater part of the State lies north of the isotherm of 69°. As in the case of Connecticut, there are doubtless many regions in this State north of the isotherm of 69° where, owing to the mild autumns, the sugar beet may be expected to grow satisfactorily for sugar-making purposes. A large part of the State is unfitted, by reason of its contour and the nature of the soil, for the culture of beets, but at least the Connecticut Valley and similar stretches of soil might be used to good advantage for this purpose.

NEW HAMPSHIRE AND VERMONT.

These States, lying north of the isotherm of 69°, will have to contend in the growth of beets with the shorter growing season and less heat for the three months of June, July, and August for forcing the beets to maturity. Nevertheless, it is doubtless true that for a distance of 100 miles, or even more, north of the isotherm of 69° beet culture could be practiced with success on account of the longer summer days. Samples of beets received from Vermont and analyzed in this laboratory show

favorable contents of sugar, and high purities. Those grown also at the experiment station of Vermont, as will be seen farther on, afford encouraging data. The thing to be feared in these localities is not inability to grow a beet rich in sugar, but the possibility of being able to harvest and secure it properly before the advent of winter. These areas do not enjoy the immunity from sudden changes of temperature, due to the lake breezes, which is characteristic of the great plain of the State of New York between Albany and Buffalo.

NEW YORK.

In this State we have a remarkable variety of ther ıal conditions. The mean isotherms of 69° and 70° pass in a southwesterly direction from Albany into the State of Pennsylvania, following, in general, the trend of the ranges of the Allegheny Mountains. The influence of these high altitudes is seen in forcing these isotherms to the south. The southeastern portion of the State of New York lies, therefore, within the belt of isotherms peculiarly favorable to beet culture, with the exception of the valley of the Hudson from a point a few miles above Poughkeepsie to the mouth of the river. This valley, including the city of New York, has a higher temperature than that deemed most suitable to beet culture. As this valley is, however, unfitted by reason of its contour to the culture of beets, the above fact is of little importance. Passing to the west of Albany, the mean summer temperatures for the three months of June, July, and August are considerably below the standards which have been mentioned until the region immediately east of Rochester is reached, where again we find a mean isotherm of 70°, and about Palmyra of almost 71°. Southwest of this the mean temperatures of the summer are again below 69°. Nevertheless, a fairly satisfactory agricultural survey of this region has shown that it is capable of producing beets of high quality; and the effects of the lake breezes upon the climate have doubtless much to do with this condition. For instance, in regions in this area where the mean summer temperature is below 69° the autumns are far more mild than in the similar regions in Minnesota, so that the months of October and November can both be relied upon with great certainty for securing the harvest of the beets. As has been before mentioned, we have in this region a nearer approach to the conditions of beet growing in northern Europe than in any other place in the United States. This whole region, therefore, must be considered and included in the area of our country where the theoretical conditions, and where the actual conditions, of temperature and precipitation favor the production of a beet of high saccharine content. If we should leave out of the calculation the southern deflection of the isotherms of 69° and 70°, due to the Appalachian system, and connect directly the area, in the neighborhood of Rochester, where these temperatures obtain, with Albany, neglecting the intermediate temperatures, we should have the isotherms occupying practically the same position in this new map that

they were made to occupy in the former maps furnished by the Signal Office for this Department. In the absence of definite information on the subject, it is fair to presume that the former maps were made in this way, and this accounts for the discrepancy in the position of the isotherm of 70° found in these maps and in the one now presented. Abundant experimental data go to show that the total area of the State of New York south of Saratoga is well suited to the growth of beets, wherever the physical conditions of contour are favorable and the soil suitable. The map of the beet area has therefore been extended so as to include this region in the beet belt.

PENNSYLVANIA.

A large portion of the State of Pennsylvania, from the thermal point of view alone, is well suited to the growth of beets. The position occupied by the belt of territory included between the isotherms of 69° and 71°, however, in the State of Pennsylvania indicates an area which, for physical reasons, is mostly unsuited to beet culture, as it covers principally the mountainous region of that State. The northwestern part of the State, especially the portion bordering on Lake Erie, has the same favorable conditions for beet culture as are found in the great valley of the State of New York; and the principal development of the industry in that State, for the physical reasons mentioned above, must be looked for in that section. South of the isotherm of 71° there may be favorable regions in the southern and eastern portions of the State, but the altitude has pushed the isotherms too far south to look for the best results in the southwestern part of the State, on account of the shorter days due to the more southern latitude. Where conditions of contour and fertility of soil are favorable, the whole portion of Pennsylvania north and west of the isotherm of 71° may be regarded as favorable to beet culture. The precipitation immediately west of the Allegheny Mountains is not so great as on the east, but there is an area in the extreme northwestern part of the State where the mean average precipitation is nearly the same as that east of the mountains, namely, between 40 and 50 inches.

OHIO.

The northeastern and northern parts of Ohio are well situated for beet culture. In general, the contour of the land is favorable, being reasonably level, and the soil is fairly fertile. The conditions in these localities are fairly comparable with those in the State of New York, except that the mean temperature is higher, the mean isotherm of 70° running in a northwesterly direction across the northern part of Ohio and entering the lake near Sandusky. It is probable also that to a considerable distance south of the isotherm of 71°, good beets can be grown, but where so large an area is found with more favoring climatic conditions, it is not well to push the industry too far south until more favorable localities are fully exploited.

MICHIGAN.

A large part of the southern peninsula of Michigan is directly in the heart of the beet belt. The contour of the soil is also favorable, being reasonably level, with an average fertility, and the data which have been secured in actual experiments in those regions are of the most encouraging kind. There seems to be no doubt of the fact that this locality is among the best in the United States for beet culture, and the modifying influence of the lake on the autumnal climate must not be lost sight of.

INDIANA.

The northern counties of Indiana, especially the northwestern, are situated in the beet area, and it is probable that the culture of the beet may be extended southward, as in the case of Ohio, as far as Fort Wayne and Lafayette, although it is not advisable for intending investors to locate in the more southern areas until the more northern have been fully exploited. The agricultural survey of the northern part of the State, undertaken by the experiment station at Lafayette, in conjunction with the work of this Department, will indicate finally with more accuracy than a mere theoretical map the most favorable conditions of culture. Great interest has been manifested in Indiana in the extreme southwestern portion, near Evansville, in the culture of the beet, and, as will be seen in the following data, many samples have been secured from that portion of the State. In many respects this region is most favorable to beet culture, particularly on account of the facilities for transportation, cheapness of fuel, and the fertility of the soil. The mean summer temperature, however, is so high as to cause grave doubts concerning the future success of beet growth in that locality.

The soil in northern Indiana is much like that of Michigan—sandy, reasonably level, and fairly fertile—and there is reason to believe that an industry profitable both to the farmer and manufacturer may grow up in that part of the country.

ILLINOIS.

The northern part of Illinois is in the beet-sugar belt, and the conditions in respect of contour of the surface and fertility of the soil, facilities and cheapness of transportation, etc., are excellent for the sugar-beet industry. The character of the soil in northern Illinois, however, is quite different from that of northern Indiana and the southern peninsula of Michigan. It is mostly a prairie soil, dark and underlaid with clay, so that the physical conditions of culture are probably not so favorable as in the other sections just named.

WISCONSIN.

Southern Wisconsin occupies a most favorable position for beet culture, and the data which have been obtained from that State by the agricultural experiment station at Madison, in conjunction with the

work of this Department, are favorable, and show great possibilities of success for the industry in that region. We begin to notice here the effects of the southwestern breezes in forcing northward the isotherms of 70° and 69°, and these hot breezes cut off from the culture of the beet large areas where soil and other conditions are extremely favorable. The same remark should be applied to the belt of country immediately south of the isotherm of 71° that has heretofore been made, namely, that there are doubtless many sections where the successful culture of the beet may be secured. This is dependent upon local conditions which must be determined by careful agricultural surveys in the future.

MINNESOTA.

The deflection in a northwesterly direction of the isotherms of 70° and 69° includes in the sugar-beet area a large portion of the State of Minnesota, especially the southeastern portion. Here there is no question of the growth of the crop and the production of beets of high saccharine qualities. The great point to be feared in this locality is the early approach of winter, and this is true of all the cis-montane western regions. We find here a drop in the rainfall from an annual average of 30 to 40 inches to one of from 20 to 30 inches. We therefore meet here a greater possibility of suffering from a dry season than in the regions of the East. As a rule, however, the quantity of rainfall during the growing season is sufficient for the production of a good crop.

IOWA.

A remarkable deflection of the isotherms of 69° and 70° is noticed in passing from Minnesota to Iowa. Not only are these isotherms deflected toward the south, but they actually take a backward course toward the east, so that their direction for a considerable distance is east of south. This brings the theoretical beet belt, so far as temperature is concerned, almost through the center of the State of Iowa. The well-known fertility of the soil of this State, with the generally level character of the surface, shows that the agricultural possibilities for the growth of sugar beets are great. In the greater part of the State the rainfall reaches 30 inches per annum, but in the northwestern part the approach to the arid region is shown by a dropping off of the average rainfall, so that it is between 20 and 30 inches. Nevertheless, experience shows that, as a rule, a sufficient rainfall is provided in all parts of the State for the growth of ordinary agricultural crops. The isotherms of 69° and 70°, after passing partly across the State of Iowa, take a sudden turn toward the north and west and pass out of the State again into Minnesota, where they reach a more northern latitude than Minneapolis. With the exception of the southwestern counties of Iowa it is fair to presume that almost the whole of the area of the State, in so far as thermal conditions and rainfall are concerned, is

suited to the growth of beets. Of course, in this matter, it should be remembered, that local conditions of soil, transportation, fuel supply, and other factors must be taken into consideration. Iowa also occupies a position where there is no tempering influence of the northwestern winds, so that it begins to feel the rigors of the winter at an earlier date than is experienced on the same isotherms east of the Great Lakes.

North and South Dakota.

The conditions which prevail in North and South Dakota are somewhat unique. From the highest position attained in Minnesota, at the border line between that State and North and South Dakota, the isotherm of 69° turns again east and south and suffers a considerable deflection, due doubtless to the lower altitude of the Red River Valley. Passing, however, into Dakota the isotherms are rapidly pushed northward by reason of the hot southwest winds which are so often experienced in the summer time in those localities. For these reasons the isotherm of 69° reaches almost as far north as Bismarck, and the isotherm of 70° is only a few miles south of it. From this point the isotherms of 69° and 70° run almost due south from North Dakota entirely across the State of South Dakota and into Nebraska. The most favorable beet-sugar belt, in so far as the temperature alone is concerned, would be the area bounded by the isotherms of 71 and 69 degrees, occupying a belt of considerable breadth running north and south through South Dakota into North Dakota, and southeast through North Dakota back into South Dakota. The depression due to the Missouri River causes an area of higher temperature to extend in a northwesterly direction into South Dakota. This area, although perhaps not so favorable to beet growth as the other, is still situated in a fertile country, and doubtless has many advantages for growing beets not possessed by the higher lands to the east and west of it. There is no question of the ability of both the regions within the area specified to grow beets of fine saccharine strength. Abundant experimental data have been secured from both the States to substantiate this statement. Caution, however, must again be given in regard to the sudden advent of the winters, especially in North Dakota, where sometimes in October, and usually in November, temperatures approaching zero or even below zero, degrees Fahrenheit, are observed. These sudden falls of temperature would prove disastrous to the beet harvests, and hence tend to restrict to a certain degree the spread of the industry in that country. Again, attention should be called to the fact that the whole of the areas in the two Dakotas, where the thermal conditions are best suited to beet culture, has an average annual rainfall of only from 15 to 20 inches. The danger of drought and the possible shortage or loss of the crop from that source are therefore increased, and we begin to approach an area where artificial irrigation must be looked to in many seasons. Probably, however, in the majority of seasons the rainfall in this vicinity would be sufficient to secure a good crop.

NEBRASKA.

A study of the position of the isotherms shows that the best part of the State of Nebraska, both as respects soil and rainfall, has an average temperature of more than 71° during the summer months. The most favorable conditions of temperature are found almost in the center of the State over an area of somewhat irregular shape, and occupying a position where the extreme distance separating the isotherms of 71° and 69° is the greatest of any in the country. In Nebraska the two isotherms of 69° and 70° run almost parallel, but the isotherm of 71° runs first in a southeasterly direction, then almost south, and finally almost due west, forming a stomach-shaped area occupying a portion of Dakota and the central portion of Nebraska. The agricultural and analytical data which have been obtained in Nebraska are very extensive, and it will be observed that both of the sugar factories which have been established in that State are south of the limit of 71°. It has been observed also, by those who have had access to the analytical data of these two factories, that the saccharine contents of the beets which have been delivered to them have not been equal to those of beets grown in more favorable localities in the United States. On the other hand, the insufficiency of the rainfall in the central and western portions of the State renders less certain the growth of sugar beets, and tends to crowd the sugar factories and the sugar industry into the wetter and more fertile portions, in spite of the fact that the temperature is higher.

THE ARID REGIONS.

It will now be necessary to trace the theoretical sugar-beet belt, so far as thermal conditions are concerned, by States through the arid regions. There is so little of the area embraced in this belt which is subject to irrigation, that it is understood at once that the possible beet-sugar industry of that region must be confined to the most favorable localities. It is interesting to see, however, how the elevation produced by the Rocky Mountain range deflects the isotherms which have been traced in a generally westerly direction up to this point so far to the south. Passing from Nebraska, the isotherm of 70° runs in a southwesterly direction to a point southwest of Denver, whence it turns in a southeasterly direction to New Mexico, thence almost due south to near the Mexican border. Being deflected to the west, it ascends on the other side of the Rocky Mountain range in a general northerly and westerly direction, passing in a northwesterly direction through Utah, thence turning west and south in Nevada, being deflected again to the south by the Sierra Nevada range of mountains, which it crosses, passing from Nevada into California, whence it passes northward again along the western slope of the Sierra Nevada Mountains until it comes near the coast line in the northern part of California. Thence the isotherm of 70° is deflected southward, almost parallel with the coast line, until it passes into lower California. It is seen that all the coast

valleys of California are included in the thermal belt most favorable to beet culture. The greater part of the area included in the thermal belt which has just been traced across the arid region is totally unsuited, on account of the mountainous and rough region of the surface, for agricultural uses. It is therefore evident that it is only in isolated places, where the surface of the land is smooth and irrigation can be practiced, that beet culture can be established. In connection with the thermal belt, the map shows that the mean average rainfall in many cases does not exceed 5 inches per annum.

In addition to the continuous belt thus marked out, there are some areas of varying temperature which demand attention, as, for instance, the elliptical area bounded by the isotherm of 70° in Idaho, of which Boise City is the center, and another area bounded by the isotherm of 70°, within which an isotherm of 71° is found, in the State of Washington. There is also one locality in Montana, on the Yellowstone River, where the average summer temperature is 71°.

In so far as thermal conditions are concerned, vast areas of the arid regions could be devoted to beet culture if the other conditions of culture were favorable. The differences of elevation of the plateaus cause numerous sudden changes of temperature, so that there are doubtless many localities not marked on the map where the mean summer temperature is almost identical with that which has been already mapped out. By reason of the meagerness of data, experimental and otherwise, relating to this whole region west of the Missouri River, the shading showing the probable extension of the beet area beyond the borders of the basic thermal belt has been omitted. The general discussion of this thermal belt, accompanied as it is by the chart of precipitation, is not necessary at this point. In general, in connection with this study, the remarks which are made in Bulletin No. 27, on page 169, and repeated in Farmers' Bulletin No. 52, may be recalled with profit:

> The mistake must not be made of supposing that all the region included within the boundaries of this zone is suitable for beet culture. Rivers, hills, and mountains occupy a large portion of it, and much of the rest would be excluded for various reasons. In the western portion, perhaps all but a small part of it would be excluded by mountains and drought. Beginning at a point midway between the one hundredth and one hundredth and first meridian, as indicated by the dotted line, beets could be grown only in exceptional places without irrigation. On the Pacific coast only that portion of the zone lying near the ocean will be found suitable for beet culture.
>
> On the other hand, there are many localities lying outside the indicated belt, both north and south, where doubtless the sugar beet will be found to thrive. The map, therefore, must be taken to indicate only in a general way those localities at or near which we should expect success to attend the growth of sugar beets in the most favorable conditions other than temperature alone.

The present map (Plate 1) gives in greater detail than ever before the boundaries of this thermal belt, by reason of the fact that the

observations of the Weather Bureau have been more numerous, and have been compiled in a more systematic manner. It would be idle to assert that subsequent observations of the Weather Bureau may not change in a marked degree the boundaries of the belt which has been mapped. It is also quite true that the agricultural surveys which will be conducted by the several States will locate definitely, beyond the limits already outlined, the areas where successful beet culture will be practiced. I may venture the prediction, however, that these areas will be contiguous to the zone which is already mapped out, and that the future beet-sugar industry of the United States, when it shall have reached a magnitude sufficient to supply to our people a large part of the sugar they consume, will be located almost entirely within the areas which have thus been traced.

DATA FROM DIFFERENT STATES.

Two methods of collecting the data from States have been pursued. In the first place, those receiving seeds directly from the Department of Agriculture were supplied with Farmers' Bulletin No. 52, giving instructions for preparing the soil, and planting and cultivating the beets. Each person was also supplied with a series of blanks for the purpose of obtaining cultural and climatic data, and for securing as great accuracy as possible in the reports which were made. The data blanks used are represented in the following forms:

UNITED STATES DEPARTMENT OF AGRICULTURE,
Washington, D. C., August 15, 1897.

DIRECTIONS FOR TAKING SAMPLES OF SUGAR BEETS FOR ANALYSIS.

Prepared by H. W. WILEY, Chief of Division of Chemistry.

When the beets appear to be mature (September 15 to November 15, according to latitude and time of planting) and before any second growth can take place, select an average row or rows, and gather every plant along a distance which should vary as follows, according to the width between rows:

From rows 16 inches apart, length 75 feet.

From rows 18 inches apart, length 66 feet.

From rows 20 inches apart, length 59 feet.

From rows 22 inches apart, length $54\frac{4}{5}$ feet.

From rows 24 inches apart, length 50 feet.

From rows 28 inches apart, length $42\frac{9}{10}$ feet.

The beets growing in the row, of the length above mentioned, are counted. The tops are removed, leaving about an inch of the stems, the beets carefully washed free of all dirt and wiped with a towel. Where the row is not long enough to meet the conditions, take enough from the adjacent row or rows to make up the required length. Rows of average excellence must be selected; avoid the best or poorest. Throw the beets promiscuously in a pile and divide the pile into two parts. This subdivision, of one-half each time, is continued until there are about ten beets in a pile. From these ten select two of medium size. Be careful not to select the largest or smallest.

From all of the rest of the beets, save these two, the necks are removed with a sharp knife at the point indicated by the dotted line in the figure (fig. 1). The beets, including the two saved as a sample, are then weighed.

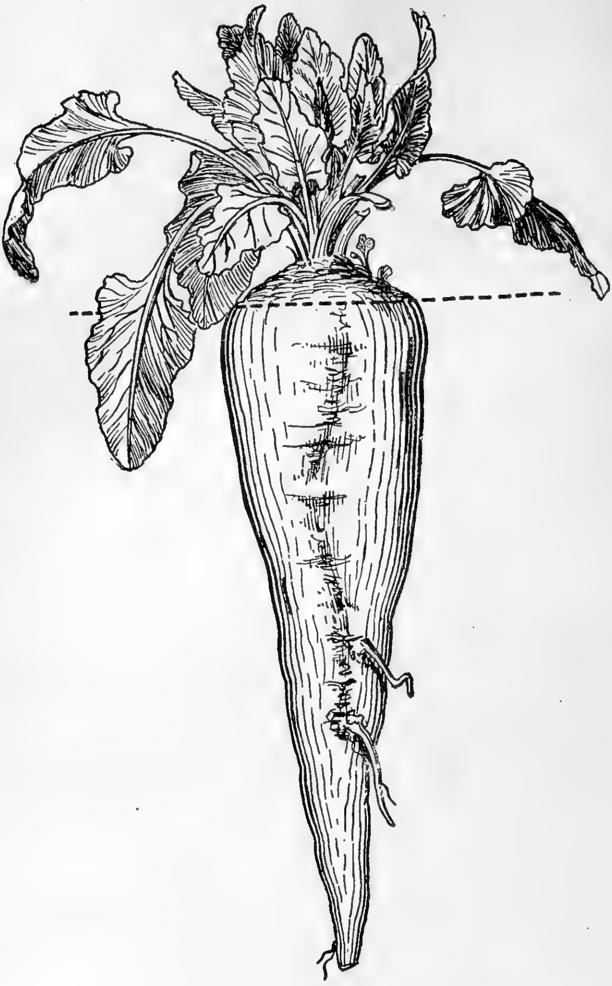

Fig. 1.—Illustration for removal of top of beet.

The number of beets harvested multiplied by 435.6 will give the total number per acre. The total weight of beets harvested multiplied by 435.6 will give the yield per acre.

Wrap the two sample beets carefully in soft paper, and write your name legibly thereon. The beets must be perfectly dry. Fill out the blank describing the beets, inclose it in the envelope, and sew it up in the bag with the beets. Attach the inclosed shipping tag to the bag and send the package by mail.

No beets will be analyzed which are not sampled as described above and properly identified.

Miscellaneous analyses of samples without accurate description are of no value.

Blanks are sent to each one for two sets of samples. From two to four weeks should elapse between the times of sending the two sets of samples.

If additional analyses be desired, other blanks will be sent on application, but not more than four analyses can be made for any one person, except in special cases.

A model, showing how blanks should be filled out, is inclosed.

[Model B.]

U. S. DEPARTMENT OF AGRICULTURE.

Model for Describing Sample of Sugar Beets.

Prepared by H. W. Wiley, Chief of Division of Chemistry.

Variety: Kleinwanzlebener.
Date planted: May 3, 1897.
Date thinned: June 3, 1897.
Date harvested: November 5, 1897.

Character of soil: Black prairie loam; in cultivation for 20 years, chiefly in corn; level, tile-drained; last crop, oats; no fertilizer was used; barnyard manure applied in 1895.

Character of cultivation (dates, implements, etc.): Plowed November, 1896, 8 inches deep, subsoiled 6 inches; harrowed with disk harrow May 1, 1897; rolled; seed planted with hand drill one-half inch deep; plants up May 16; stand excellent; hoed by hand May 22; plowed with horse hoe May 28 and June 8, 16, 24, July 3, 10, and 17.

Length of row harvested (feet): 66.

Width between rows (inches): 18.

Number of beets harvested: 88.

Total weight of beets, less necks and tops (pounds): 88.

Weather for each month: May, dry; June, copious rains; July, fine growing weather; August, hot and dry; September, dry until the 24th, when a heavy rain fell.

State: Iowa.

Post-office: Hanover, Buena Vista County.

Date: November 17, 1897.

Name: Robert Simpson.

NOTE.—Beets will not be analyzed unless accompanied with description as above.

It is evident that in promiscuous experimentation of this kind, even when directions are closely followed, and when all the operations are conducted in accordance with the directions in Farmers' Bulletin No. 52, and the procedure described in the blanks for taking samples faithfully followed, the data are still of an unsatisfactory nature. For instance, when a plot of beets has been harvested and quartered until the two beets required for a sample have been selected in accordance with directions, we still have an uncertainty prevailing as to whether the two beets correctly represent the whole lot. In fact, it is well known that the variations in the character of beets grown side by side are very great, far more so than is the case with sugar canes. As an illustration of this, the following analyses, giving the weight and sugar content of every beet grown in a row at the experiment station of Kentucky, is sufficient evidence:

Analyses of all the beets in a row, Kentucky station.

Serial No.	Weight after topping.	Sucrose in beets.	Serial No.	Weight after topping.	Sucrose in beets.	Serial No.	Weight after topping.	Sucrose in beets.
	Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*
1985	27	7.7	2009	8	8.2	2033	10	8.1
1986	25	9.9	2010	4	9.3	2034	10	7.2
1987	24	10.4	2011	1	9.9	2035	12½	9.1
1988	24	10.6	2012	1	10.5	2036	11	9.0
1989	20	8.6	2013	2	9.6	2037	11	9.8
1990	20	7.9	2014	3½	10.9	2038	9	8.8
1991	28	6.7	2015	3½	9.9	2039	9	7.4
1992	31	9.0	2016	34	8.2	2040	8	9.7
1993	18	10.4	2017	27	7.0	2041	11	8.9
1994	24	9.0	2018	20	9.3	2042	8	9.3
1995	53	4.8	2019	8	11.9	2043	9	6.9
1996	19	8.2	2020	16	6.2	2044	8	10.4
1997	33	2.6	2021	22	8.0	2045	7	9.4
1998	16	9.9	2022	15	6.8	2046	5	8.2
1999	2	10.7	2023	20	9.8	2047	4	8.4
2000	2	8.8	2024	26	9.0	2048	5	8.6
2001	2	9.6	2025	16	9.4	2049	4	8.7
2002	13	8.9	2026	18	9.7	2050	4	10.5
2003	8	9.6	2027	18	6.6	2051	4	9.3
2004	12	11.0	2028	15	8.6	2052	3	10.7
2005	6	10.5	2029	11	9.3	2053	2	12.2
2006	3	11.1	2030	17	4.9	2054	1½	10.6
2007	5	10.6	2031	12	6.8	2055	1	9.9
2008	1¾	10.2	2032	12	6.9	2056	1½	11.2

The great variations which exist, both in size and quality of beets, are most strikingly shown by the above figures. The variation in size extends from 1 to 53 ounces, and in sugar content from 2.6 to 12.2 per cent. When, however, it is considered that all overgrown and undergrown beets are rejected in taking the samples, and only those of medium size and perfect form selected, it is evident that the chances of the sample representing fairly the average of the whole lot are very much improved. Even granting this, however, it is unsatisfactory to depend upon the analysis of two or three samples alone for determining the character of the whole plot. It is evident, however, that on account of the nature of the method of investigation and the undesirability of burdening the mails with too many samples, it is impracticable to do better than has been done in this matter. The analyses of all of the samples which were sent to the Department of Agriculture from each of the States and Territories are given in the tables which are found farther along. For convenience of reference, the analyses are tabulated by counties in each case.

The second method of collecting data was through the cooperation of the agricultural experiment stations. To facilitate this, the Secretary of Agriculture appointed the directors of these stations special correspondents of the Department for distributing the seed and collecting the beets for analysis. The analyses were made by the chemists of the several stations, and they are given below, grouped under the various States. Where the cooperation of the agricultural experiment stations was secured, the reports are given by the director or officer in charge. Inasmuch as the details of these analyses are published by the various stations, including the names and residences of the persons who grew the beets, in the present report only the averages of the analyses by counties or sections, together with such observations as have seemed desirable, are given. The reports of the directors and other officers in charge contain much interesting material, and in some cases are given without abbreviation.

DATA OBTAINED IN THE LABORATORY OF THE DEPARTMENT OF AGRICULTURE.

The analytical data obtained during the season of 1897 in the Department of Agriculture have been classified as follows:

The data obtained from each State or Territory collected by counties or sections and the general average for each county are as follows:

The analytical tables showing the data of the Department samples contain the names of the States and counties arranged alphabetically. The name of each county is followed by a symbol in the shape of a square to designate the position of the county in the State. The plain square shows that the county is situated in the central portion, while a straight line attached to the center of the top of the square shows the county is in the northern part of the State; attached in a diagonal

direction to the upper right-hand corner, that it is in the northeastern portion of the State; attached to the center of the right side, shows it is in the eastern portion of the State; attached to the lower right-hand corner, that it is in the southeastern portion; attached to the center of the lower side of the square, that it is in the southern part; to the lower left-hand corner, in the southwestern; to the center of the left-hand side of the square, in the western part, and to the upper left-hand corner, in the northwestern.

The tables also state the number of samples received from each county, the average weight of the samples in ounces, the average per cent of sugar in the beet, the average purity coefficient of the juice, and the maxima and minima percentages of sugar in the juice and the coefficients of purity.

In many cases the quantity of juice was too small to compute the purity in the usual way, and in others the low percentage of sugar rendered the ascertainment of the purity unnecessary. These two reasons account for the omission in many instances of the number expressing the purity of the juice.

CAUTIONS REGARDING THE VALUE OF THE DATA.

It is highly important that the persons using the analytical data contained in the following tables be cautioned in regard to the value which should be attached thereto. It is evident, in the first place, that samples which have been grown in such a promiscuous way as those received by the Department, in so many different characters of soil, under so many different climatic conditions, and with such variable culture, water supply, and fertilizing materials, must lack that uniformity of value which should characterize scientific data in general. Attention has already been called, moreover, to the fact that the few samples of beets which have been sent can not be regarded as exactly representing the whole mass of which they originally formed a part. The variations in individuals are so great under practically identical conditions as to render somewhat doubtful data which are based upon a few samples alone. For instance, in the comparison of different States in respect of sugar-producing qualities, it may be that one State is represented by perhaps less than 50 samples, while others may have 500 or 1,000. In such cases the average of the 50 samples does not in any way present such convincing data as the average of 1,000. The greater the number of samples examined, the more nearly will the disturbing influences of individuals be eliminated. When it comes to a comparison of the counties in the several States, the same remarks are true. In many instances a county may be represented by a single sample. It may be that the sample is extremely good or extremely poor. In neither case is it representative. It would be unjust, therefore, to compare a county with one sample with another from which 50, 100, or 200 samples have been received. Even in the averages representing

the samples from a single county or locality care must be taken not to be misled. The samples may include, for instance, a very small beet with an excessive sugar content, or a very large one with a deficient sugar content. In case only two or three samples constitute the whole number, the influence of these abnormal samples is raised to a maximum. As an illustration of this, the analysis of samples from Clinton County, Ill., may be cited as a type of many others. Three samples were received from this county, the average weight of which was 13 ounces, and the average sugar content 15.7 per cent. One of these samples, however, weighed only 4 ounces, and had the abnormal sugar content of 21.2 per cent. It is evident, therefore, that the average percentage of sugar in the three samples is very much higher than it would have been had they all been normal in size.

Another point must not be forgotten, and that is, granting that the samples of any locality are representative, they represent only one season. That season may have been peculiarly favorable or unfavorable, and hence no section should be judged by the results of a single year's experiment. The reader who wishes to study critically the data which follow must take all these facts into consideration, and the judgment which he may form in regard to any particular section must be subject to the rectifications indicated by the variable factors mentioned above.

Table showing mean analyses and maxima and minima of the beets examined in the chemical laboratory of the United States Department of Agriculture during 1897, arranged alphabetically by States and counties.

State.	County.	Number of samples.	Averages.			Maxima.			Minima.		
			Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient
			Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*	
Arizona	Apache □	1	26	9.6	70.4						
	Pima □	6	23	9.3		30	12.0		9	7.6	
Averages, etc		7	23	9.3		30	12.0		9	7.6	
Arkansas	Phillips □	1	19	10.6							
	Poinsett □	1	17	11.9	71.5						
Averages, etc		2	18	11.3		19	11.9		17	10.6	
California	Mendocino □	1	26	16.8							
Colorado	Bent □	2	19	17.1		20	19.4		18	14.7	
	Boulder □	9	31	15.3	80.9	62	20.0	86.4	15	12.5	77.0
	Chaffee □	2	22	15.5		28	17.4		16	13.6	
	Conejos □	12	29	13.9	77.9	49	17.0	85.9	12	10.5	70.6
	Costilla □	4	20	13.2	82.3	28	16.3	86.9	12	9.3	84.6
	Delta □	2	20	17.1	80.5	23	18.6	84.3	16	15.5	76.7
	Douglas □	5	23	15.1	76.8	34	18.7	85.5	12	9.6	69.4
	Eagle □	1	14	14.5	81.7						
	Elbert □	13	18	14.7	77.6	45	18.7	87.7	8	9.7	68.9
	El Paso □	3	22	13.9	76.6	39	14.7	80.1	6	12.7	73.1
	Fremont □	4	19	14.8	80.7	33	17.0	84.8	11	12.4	75.6
	Garfield □	16	14	16.6	83.2	28	20.9	85.9	9	14.4	79.4
	Huerfano □	1	14	17.8							
	Larimer □	9	21	13.3	77.8	28	16.7	84.5	14	8.8	68.9
	Logan □	23	15	9.6	73.8	43	16.5	83.3	4	4.1	63.4
	Mesa □	4	29	15.1	81.9	49	17.6	88.1	18	11.9	75.6
	Morgan □	34	16	12.0	75.5	32	16.1	82.8	6	8.1	68.0
	Otero □	6	28	13.7	79.0	35	17.3	84.3	16	10.7	75.2
	Phillips □	4	33	12.0	71.4	60	14.7	75.4	18	9.7	68.9
	Prowers □	5	20	14.8	77.5	34	17.1	83.9	10	12.0	72.8
	Pueblo □	1	16	20.2	85.9						
	Rio Grande □	5	20	15.1	80.0	33	17.6	84.1	7	12.4	76.5
	Routt □	2	10	18.8		11	19.0		10	18.6	
	Saguache □	3	23	12.1		34	16.5		10	8.5	
	Washington □	2	15	14.3	80.2	19	14.8	82.0	11	13.8	78.4
	Weld □	2	34	14.8	86.5	40	16.2	87.0	27	13.4	85.9
Averages, etc		174	20	13.6	76.7	62	20.9	88.1	4	4.1	63.4

Table showing mean analyses and maxima and minima of the beets examined in the chemical laboratory of the United States Department of Agriculture during 1897, arranged alphabetically by States and counties—Continued.

State.	County.	Number of samples.	Averages. Weight.	Averages. Sugar in the beet.	Averages. Purity coefficient	Maxima. Weight.	Maxima. Sugar in the beet.	Maxima. Purity coefficient	Minima. Weight.	Minima. Sugar in the beet.	Minima. Purity coefficient
			Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*	
Idaho	Bingham □	5	18	16.2	80.5	26	18.2	86.7	6	13.9	73.2
	Fremont □	2	27	14.0	77.1	32	16.1	80.1	21	11.9	74.1
Averages, etc		7	21	15.5	79.4	32	18.2	86.7	6	13.9	73.2
Illinois	Bureau □	1	15	11.6	78.1	....	....	....	....	....	....
	Clark □	1	18	13.8	86.8	....	....	....	....	....	....
	Clinton □	3	13	15.7	73.7	21	21.2	74.1	4	12.8	73.2
	Cook □	6	12	12.7	76.8	17	18.7	78.4	6	10.0	75.2
	Cumberland □	2	24	14.3	77.8	32	15.2	84.7	16	13.4	70.9
	Edwards □	1	8	12.7	69.0	....	....	....	....	....	....
	Effingham □	2	8	11.1	....	8	11.8	....	7	10.3	....
	Franklin □	1	20	11.2	67.8	....	....	....	....	....	....
	Henry □	3	18	13.6	76.2	19	14.5	80.8	16	12.6	73.7
	Jackson □	1	13	14.0	76.6	....	....	....	....	....	....
	Jefferson □	1	9	10.2	....	....	....	....	....	....	....
	McHenry □	1	57	11.9	73.0	....	....	....	....	....	....
	Macoupin □	1	12	16.1	72.2	....	....	....	....	....	....
	Mason □	1	30	12.6	81.0	....	....	....	....	....	....
	Peoria □	1	22	14.7	77.0	....	....	....	....	....	....
	Rock Island □	1	30	10.6	76.1	....	....	....	....	....	....
	Saint Clair □	2	12	16.4	....	13	16.6	....	10	16.2	....
	Sangamon □	2	14	12.4	69.9	16	12.8	72.0	11	11.9	67.7
	Union □	1	26	8.3	....	....	....	....	....	....	....
Averages, etc		32	17	13.1	75.5	57	21.2	86.8	4	8.3	67.7
Indiana	Allen □	3	28	13.4	77.7	37	15.0	78.7	17	11.9	76.4
	Delaware □	1	20	14.3	77.3	....	....	....	....	....	....
	Elkhart □	4	15	14.8	77.6	16	16.0	82.1	13	13.6	72.6
	Hendricks □	1	14	13.9	82.9	....	....	....	....	....	....
	Henry □	8	17	13.1	78.5	25	15.9	81.6	5	9.4	73.1
	Knox □	1	28	10.0	71.4	....	....	....	....	....	....
	Madison □	3	16	14.4	82.4	17	17.1	85.6	14	12.1	79.1
	Marion □	1	9	15.1	81.9	....	....	....	....	....	....
	Morgan □	3	14	14.8	80.3	17	14.9	80.8	9	14.3	78.8
	Pulaski □	6	16	13.5	73.2	20	14.9	78.4	10	11.9	74.6
	Rush □	1	21	12.9	80.0	....	....	....	....	....	....
	Starke □	10	12.8	15.7	81.8	17	18.4	88.4	9	11.4	71.3
	Tippecanoe □	17	7	15.1	81.1	20	19.1	84.4	3	12.3	78.2

	Union	2	15	14.7	79.8	16	15.3	82.9	14	14.0	76.6
	Vanderburg	40	14	11.2	77.3	42	13.8	87.7	7	7.8	71.4
	Warrick	1	14	8.2							
	Whitley	1	16	14.0	83.1						
Averages, etc		103	14	13.1	78.9	57	21.2	88.4	3	7.8	8.2
Iowa	Adair	1	19	12.6	74.2						
	Adams	3	19	12.9	75.4	24	13.4	78.8	17	12.2	68.8
	Allamakee	1	20	14.7	76.6						
	Appanoose	1	7	19.0							
	Benton	6	16	13.8	76.9	18	18.2	77.7	13	9.5	73.4
	Bremer	2	15	13.6	81.3	15	15.7	83.3	14	11.6	79.2
	Butler	1	48	10.7	72.7						
	Calhoun	2	10	18.1		12	18.1		10	16.1	
	Carroll	1	20	14.0	80.8						
	Cass	3	17	11.4	71.7	20	12.3	75.0	16	10.8	67.7
	Cerro Gordo	1	32	12.7	77.8						
	Clinton	5	11	16.8	75.8	12	18.2	77.7	9	15.4	73.2
	Crawford	2	20	8.5		24	11.0		15	6.1	
	Dallas	3	18	13.9	76.4	26	14.8	79.1	14	13.3	75.1
	Davis	2	15	16.1	72.4	20	16.4	74.1	10	15.8	70.8
	Decatur	1	16	15.6	79.2						
	Dickinson	1	15	10.9	69.7						
	Dubuque	1	17	10.0	68.3						
	Franklin	1	14	14.3	73.5						
	Greene	39	21	12.7	76.3	32	16.7	87.4	10	9.8	66.7
	Guthrie	6	23	12.5	78.8	30	15.0	84.0	17	10.0	74.5
	Howard	1	24	15.3	78.8						
	Humboldt	1	8	18.0							
	Jefferson	1	14	11.8	76.5						
	Keokuk	3	12	13.2		15	14.3		7	12.5	
	Kossuth	2	32	10.7	72.7	34	11.1	73.9	30	10.3	71.5
	Linn	1	10	11.8	67.7						
	Louisa	2	19	12.8	70.3	20	13.3	71.7	18	12.2	68.8
	Monona	1	13	13.8	78.8						
	Muscatine	2	18	14.3	80.8	18	14.3	81.0	17	14.2	80.6
	O'Brien	15	16	13.8	76.1	32	16.4	83.0	9	9.6	69.1
	Polk	1	10	11.3							
	Story	5	13	14.7	76.6	20	17.3	82.6	11	12.8	72.1
	Tama	3	20	11.9	78.0	24	13.5	80.6	15	10.7	74.9
	Van Buren	3	19	13.0	74.5	21	18.0	83.2	17	10.5	65.9
	Washington	3	18	13.7	78.8	26	15.0	84.8	14	12.5	71.3
	Wayne	1	10	14.0							
	Winneshiek	2	18	13.4	78.3	22	13.6	79.9	14	13.1	76.6
Averages, etc		130	18	13.3	73.7	48	19.0	87.4	7	6.1	65.9
Kansas	Allen	2	28	11.1	71.5	35	11.5	71.8	20	10.6	71.2
	Anderson	2	88	10.9	74.5	110	10.9	76.0	65	10.8	72.9
	Barton	26	24	11.0	72.4	57	13.3	78.3	10	7.2	65.7
	Clay	1	37	9.7	68.9						

Table showing mean analyses and maxima and minima of the beets examined in the chemical laboratory of the United States Department of Agriculture during 1897, arranged alphabetically by States and counties—Continued.

State.	County.	Number of samples.	Averages.			Maxima.			Minima.		
			Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient
			Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*	
Kansas	Cloud	1	15	14.8	82.4						
	Douglas	2	26	12.7	80.4	28	13.3	80.8	23	12.1	79.9
	Lane	2	11	16.2	84.5	11	17.8	85.3	10	14.6	83.6
	Montgomery	2	15	11.2		21	15.7		8	6.6	
	Morris	1	34	11.5	70.4						
	Sedgwick	1	22	13.8	70.8						
	Woodson	1	35	10.8	73.5						
	Wyandotte	1	48	9.4							
Averages, etc.		41	27	11.4	73.8	110	17.8	85.3	8	6.6	65.7
Kentucky	Daviess	1	9	15.7	83.3						
	Fayette	4	19	11.2	68.5	21	13.3	72.5	17	9.5	65.0
	Henry	1	10	11.1							
Averages, etc.		6	16	11.9	71.5	21	15.7	83.3	9	9.5	65.0
Maryland	Anne Arundel	4	22	7.7	73.8	26	10.5	80.3	19	3.2	67.2
	Baltimore	3	21	9.8		38	11.1		8	8.9	
	Frederick	2	20	13.5	82.9	24	13.7	83.2	15	13.2	82.7
	Harford	4	13	13.8	78.9	16	15.7	82.7	7	11.6	76.6
	Montgomery	4	23	11.9	85.0	35	14.6	85.4	18	8.6	84.5
	Prince George	3	16	12.9	81.9	26	13.6	85.7	11	12.6	79.7
	Talbot	3	15	11.2	78.9	19	12.9	81.8	10	9.3	75.9
	Washington	5	18	11.8	73.5	25	15.6	77.1	12	8.0	66.8
	Wicomico	1	32	9.0							
Averages, etc		29	19	11.4	79.1	38	15.7	85.7	7	3.2	66.8
Michigan	Allegan	3	62	6.8		82	9.9		50	4.1	
	Alpena	2	18	13.7	81.2	24	14.4	85.4	12	13.0	77.0
	Arenac	1	26	8.9							
	Barry	1	19	15.2	83.7						
	Bay	5	24	14.2	80.5	40	16.2	83.7	16	13.2	74.6
	Calhoun	8	17	15.8	83.2	32	16.9	89.8	12	15.1	79.8
	Delta	2	17	16.4		24	20.2		10	12.5	
	Dickinson	2	18	14.1	81.4	18	14.1	81.4	17	12.7	75.6
	Genesee	1	28	14.6	81.4						
	Huron	3	19	15.3	81.9	24	16.2	82.9	16	14.2	81.0
	Isabella	5	24	13.3	82.2	26	16.4	86.8	20	8.2	85.7

	Kalamazoo	2	24	16.7	78.9	29	19.0	85.7	18	14.3	72.2
	Kalkaska	1	35	16.5	82.9						
	Macomb	3	13	16.8	80.8	14	18.6	83.2	10	13.3	78.3
	Manistee	1	14	15.5	87.1						
	Montmorency	1	22	15.5	84.0						
	Oakland	1	16	17.4	82.7						
	Ottawa	1	9	17.0	86.0						
	St. Joseph	1	22	11.6	77.2						
	Saginaw	399	22	14.8	83.3	37	19.6	91.0	9	9.8	67.9
	Sanilac	5	25	14.6	81.9	36	16.6	84.8	16	10.4	78.5
	Schoolcraft	1	28	12.3	73.8						
Averages, etc		450	22	14.7	81.1	82	20.2	9.0	9	4.1	67.9
Minnesota	Aitkin	3	31	11.5	79.7	51	15.4	81.7	10	6.9	77.6
	Carlton	1	14	15.0	84.8						
	Dakota	3	26	12.2	75.2	28	13.2	77.3	25	11.1	71.5
	Dodge	1	24	13.0	77.0						
	Freeborn	12	20	14.1	82.3	28	15.6	86.3	15	12.3	75.0
	Goodhue	8	23	11.7	76.1	36	13.8	83.5	16	7.7	72.7
	Hennepin	1	43	13.3	79.4						
	Mower	1	19	13.2	75.8						
	Nicollet	2	31	11.3	72.3	32	10.9	77.1	29	10.9	67.5
	Ottertail	4	23	14.9	82.1	30	16.0	82.3	14	13.5	82.0
	Polk	1	8	17.7							
	Redwood	1	30	12.0	75.9						
	Rice	1	18	13.7	82.7						
	Scott	1	14	10.9	73.5						
	Stearns	9	29	12.7	79.8	48	15.9	83.4	20	10.4	72.6
Averages, etc		49	24	11.0	79.2	51	17.7	86.3	8	6.9	67.5
Missouri	Adair	4	25	12.5	74.5	38	13.9	77.6	14	9.9	70.3
	Atchison	5	53	10.6	73.3	59	12.0	75.2	34	6.3	72.2
	Audrain	3	34	6.1		47	10.2		21	8.2	
	Barry	7	15	15.3	76.4	28	18.6	82.0	8	11.0	68.2
	Barton	3	27	15.3	77.3	34	16.5	77.9	22	13.5	76.4
	Bates	1	12	10.5	62.5						
	Benton	5	16	15.5	77.1	33	18.8	78.8	10	13.0	74.9
	Boone	2	11	11.1		12	12.6		10	9.5	
	Bollinger	1	14	15.6	67.8						
	Buchanan	2	30	11.0		43	13.7		16	8.2	
	Caldwell	7	25	11.2	72.5	41	12.6	76.7	12	9.5	70.0
	Callaway	5	19	9.9	77.0	29	14.6	78.5	10	4.1	74.0
	Camden	2	14	13.8	76.5	14	13.9	77.8	13	13.7	75.2
	Cape Girardeau	2	8	12.4		9	18.1		7	6.6	
	Carroll	6	27	11.8	77.6	43	14.8	84.5	4	8.1	70.1
	Cass	4	19	11.9	66.2	24	13.5	77.5	16	9.6	58.7
	Cedar	4	17	10.6		30	13.9		6	7.2	
	Chariton	5	17	11.7	75.8	28	16.2	79.1	10	8.3	72.4
	Christian	2	12	13.3	78.9	15	13.5	83.0	8	13.1	74.9
	Clay	1	29	8.8							

Table showing mean analyses and maxima and minima of the beets examined in the chemical laboratory of the United States Department of Agriculture during 1897, arranged alphabetically by States and counties—Continued.

State.	County.	Number of samples.	Averages.			Maxima.			Minima.		
			Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient
			Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*	
Missouri	Clinton	1	24	8.8							
	Cooper	21	16	10.0	72.1	39	12.8	77.0	2	7.0	68.6
	Crawford	2	9	11.3		10	11.9		8	10.7	
	Dade	2	14	13.1		17	13.6		11	12.6	
	Dallas	2	10	11.9		10	12.3		10	11.4	
	Daviess	2	21	14.8	78.0	26	15.9	82.3	15	13.6	73.7
	Dekalb	4	31	10.6	69.6	45	11.6	72.5	12	9.9	65.6
	Douglas	3	8	15.3	79.4	10	17.1	83.2	4	13.2	77.1
	Franklin	6	23	12.8	72.5	37	17.2	83.2	12	9.8	68.7
	Gasconade	10	23	11.0	72.4	31	15.5	78.5	16	7.0	65.9
	Gentry	5	28	12.3	73.2	64	14.7	79.0	13	10.4	69.1
	Greeley	1	12	3.6							
	Greene	8	17	11.3	73.2	28	16.7	83.7	8	7.6	57.8
	Grundy	3	23	11.0	72.3	28	11.8	73.0	17	10.2	71.3
	Harrison	4	12	14.5	77.9	17	16.4	84.2	5	12.3	74.2
	Henry	8	18	11.9	71.5	37	17.9	74.1	3	8.9	69.3
	Hickory	1	20	11.4	70.9						
	Holt	8	31	12.3	79.1	54	14.3	83.7	17	8.7	74.0
	Howard	3	16	11.8		26	14.9		5	6.7	
	Howell	5	24	11.2	78.9	35	15.3	82.0	16	5.7	75.8
	Iron	1	3	14.8							
	Jackson	1	38	10.7	70.2						
	Jasper	3	33	12.1		38	14.3		28	10.7	
	Jefferson	6	16	12.3	75.0	24	14.4	79.9	10	10.9	72.6
	Knox	1	36	10.3	67.9						
	Laclede	3	10	12.0		20	12.4		4	11.3	
	Lafayette	6	29	11.6	74.5	50	14.1	80.0	10	9.6	68.3
	Lawrence	10	18	10.2	72.5	26	14.2	79.1	11	6.2	63.2
	Lewis	1	20	10.5	65.1						
	Lincoln	2	14	11.8	72.5	14	12.5	76.6	13	11.2	68.3
	Linn	3	15	12.9	74.8	18	15.2	75.0	12	11.0	74.7
	McDonald	1	21	13.3	85.3						
	Macon	1	10	14.2	72.3						
	Marion	2	15	10.0		15	11.4		15	8.5	
	Mercer	1	44	11.5	75.5						
	Miller	2	17	12.5	71.3	17	15.4	82.2	17	9.7	60.4
	Moniteau	1	10	12.1	74.3						
	Monroe	3	19	12.0	69.8	20	13.1	71.1	17	10.8	68.5
	Montgomery	8	16	8.8	69.2	26	11.4	75.4	9	3.6	59.5
	Morgan	1	11	9.3							

	New Madrid □	4	16	11.3	74.3	28	11.8	74.7	6	10.7	73.8
	Newton □	7	15	12.7	74.3	20	19.8	78.8	2	10.0	68.7
	Nodaway □	6	30	11.1	72.7	47	15.9	77.4	18	8.0	65.1
	Ozark □	1	4	13.3							
	Perry □	1	22	9.8	73.6						
	Pettis □	5	20	10.8	71.6	27	12.9	74.2	14	8.4	68.7
	Phelps □	3	9	14.0		11	15.4		8	13.2	
	Pike □	6	22	12.1	68.7	56	14.4	76.3	3	10.2	60.9
	Platte □	5	31	10.3	71.2	44	11.3	74.0	16	8.6	66.3
	Polk □	2	24	12.4	76.9	27	13.2	79.3	20	11.5	74.5
	Pulaski □	1	12	18.3	86.1						
	Putnam □	2	6	14.6		6	15.9		6	13.4	
	Ralls □	1	21	8.1							
	Ray □	1	34	10.5	68.3						
	St. Charles □	4	19	11.9	76.1	29	14.4	77.1	15	10.3	75.0
	St. Clair □	6	13	12.8	74.2	24	17.4	76.0	6	9.0	72.0
	St. François □	1	11	11.8	67.7						
	St. Louis □	5	20	10.4		43	15.7		5	6.6	
	Saline □	7	23	11.5	74.2	47	12.7	77.5	13	10.6	69.3
	Schuyler □	1	13	13.2	72.6						
	Scotland □	1	19	14.3	75.8						
	Scott □	2	9	11.3		9	13.3		9	9.2	
	Shannon □	2	9	12.0		9	13.1		9	10.9	
	Shelby □	4	18	11.5	67.5	30	15.5	69.3	10	8.3	65.7
	Texas □	2	15	12.4	70.3	20	12.8	71.2	10	12.0	69.4
	Vernon □	4	21	11.0	66.1	26	12.7	72.6	13	8.1	58.7
	Warren □	5	20	11.4	75.7	25	15.2	83.2	13	9.4	71.1
	Wayne □	2	23	11.1		29	11.4		17	10.7	
	Webster □	3	17	10.4		31	12.0		9	8.9	
	Wright □	3	18	15.7	77.8	20	17.0	80.6	16	13.4	74.9
Averages, etc.		324	20	11.7	73.5	64	19.8	86.3	2	3.6	57.8
Montana	Dawson □	1	12	13.8	79.7						
	Gallatin □	1	29	13.1	77.1						
	Lewis and Clarke □	1	15	18.6	81.6						
	Yellowstone □	1	25	11.9	72.8						
Averages, etc.		4	20	14.4	77.8	29	18.6	81.6	12	11.9	72.8
Nebraska	Cheyenne □	2	13	15.7		14	17.3		12	14.0	
	Dakota □	1	37	17.0	80.2						
	Lancaster □	2	20	11.9	74.4	20	13.1	75.7	20	10.6	73.0
	Nemaha □	3	32	12.7	76.4	33	13.3	78.5	32	12.2	74.0
	Pawnee □	2	51	8.8		58	9.1		43	8.5	
	Richardson □	1	17	15.0	78.2						
	Saunders □	1	25	12.7	76.9						
	Washington □	1	34	13.0	78.6						
Averages, etc.		13	29	12.9	76.9	58	17.3	80.2	12	8.5	72.8

Table showing mean analyses and maxima and minima of the beets examined in the chemical laboratory of the United States Department of Agriculture during 1897, arranged alphabetically by States and counties—Continued.

State.	County.	Number of samples.	Averages.			Maxima.			Minima.		
			Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient	Weight.	Sugar in the beet.	Purity coefficient
			Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*	
Nevada	Esmeralda	2	25	17.5	81.1	27	17.6	81.8	22	17.3	80.4
	Humboldt	10	21	18.8	83.1	34	20.8	84.5	8	16.3	82.2
	Lander	1	10	20.3	85.5						
	Lyon	3	19	17.6	79.6	20	18.0	80.1	19	16.9	79.0
	Washoe	4	10	18.2		15	20.0		4	17.1	
	White Pine	1	8	16.0	75.4						
Averages, etc		21	18	18.3	81.4	34	20.8	85.5	4	16.0	75.4
New Jersey	Atlantic	2	24	14.8	81.9	38	17.6	87.2	10	12.0	76.5
	Burlington	1	17	18.7	83.7						
	Camden	2	22	12.9	80.0	28	14.1	82.2	16	11.6	77.7
	Cumberland	2	9	15.8		9	16.2		9	15.4	
	Essex	7	17	13.3	79.2	22	14.9	83.0	14	9.8	67.8
	Mercer	7	20	11.5	79.3	34	13.6	83.1	13	8.6	76.2
	Ocean	8	8	16.4	86.3	11	18.5	90.1	5	12.6	82.5
	Warren	2	20	14.9	87.6	24	15.6	88.6	16	14.2	86.6
Averages, etc		31	16	14.2	81.4	38	18.7	90.1	5	8.6	67.8
New Mexico	Mora	3	13	17.2	82.0	14	18.5	86.2	11	16.5	78.2
New York	Albany	2	19	14.0		19	16.0		19	12.0	
	Broome	4	22	15.1	82.8	29	16.1	87.1	15	12.8	76.6
	Cattaraugus	15	18	15.1	81.9	28	17.6	86.7	8	11.8	73.0
	Chautauqua	45	21	16.6	82.7	48	20.0	86.2	10	10.2	75.0
	Chenango	3	16	15.4	78.7	20	15.5	83.8	13	15.3	70.8
	Columbia	1	20	14.7	81.5						
	Dutchess	4	16	17.3	85.1	18	22.6	89.1	13	14.5	82.7
	Erie	37	19	15.9	83.9	39	19.2	90.6	5	9.7	66.6
	Fulton	2	24	15.4	83.6	26	16.6	84.4	21	14.1	82.7
	Herkimer	1	16	16.5	78.9						
	Lewis	2	21	13.9	77.8	22	14.3	79.4	20	13.4	76.2
	Livingston	3	20	16.8	79.8	25	18.2	83.9	16	14.4	76.7
	Madison	3	14	17.3	78.1	20	20.2	81.3	8	15.0	74.8
	Monroe	3	23	13.1	79.8	27	15.9	85.2	21	13.1	72.7
	Niagara	9	28	14.5	81.9	38	16.6	88.7	16	12.1	76.6
	Oneida	22	14	13.6	81.8	67	17.2	88.2	6	9.7	71.2
	Onondaga	7	17	17.5	83.2	25	19.5	86.4	9	15.5	82.1
	Ontario	22	17	15.0	83.4	20	16.8	87.8	13	12.5	73.5

	Orleans	3	27	16.7	85.4	34	17.5	86.7	16	15.2	84.5
	Otsego	3	24	13.2	80.9	37	14.8	82.1	17	11.3	78.8
	St. Lawrence	3	34	13.1	...	30	15.9	...	30	11.1	...
	Schuyler	1	25	13.8	82.4	...	...	...	...	...	...
	Steuben	2	24	17.0	85.5	24	17.3	85.7	24	16.7	85.3
	Suffolk	1	24	16.9	83.0	...	...	...	...	...	...
	Wayne	8	23	14.5	81.2	39	17.5	87.2	13	13.5	77.5
	Westchester	4	10	12.1	...	16	13.9	...	7	10.0	...
	Yates	15	23	12.7	79.6	50	17.1	88.6	8	9.0	73.2
Averages, etc	...	225	21	15.0	82.4	67	22.6	90.6	5	9.0	70.8
North Carolina	Cherokee	2	36	7.1	...	36	7.6	...	29	6.5	...
	Davidson	2	18	8.3	...	20	9.2	...	15	7.4	...
	Mecklenburg	1	20	11.9	...	...	...	...	...	...	...
	New Hanover	1	17	10.2	72.8	...	...	...	...	...	...
	Rowan	1	27	10.6	77.7	...	...	...	...	...	...
Averages, etc	...	7	23	9.1	75.3	36	11.9	77.7	15	6.5	72.8
North Dakota	Benson	1	17	10.8	...	...	...	...	...	...	...
	Pembina	1	39	10.6	...	...	...	...	...	...	...
	Richland	1	30	11.6	81.2	...	...	...	...	...	...
	Walsh	1	26	9.1	...	...	...	...	...	...	...
Averages, etc	...	4	28	10.5	...	39	11.6	...	17	9.1	...
Ohio	Allen	1	33	13.3	74.8	...	...	...	...	...	...
	Auglaize	1	16	7.4	...	...	...	...	...	...	...
	Ashtabula	4	24	15.3	84.1	33	16.2	87.6	17	13.9	78.5
	Brown	2	21	11.9	71.4	23	13.5	73.5	19	10.3	69.2
	Champaign	2	21	13.9	79.7	22	14.3	80.2	20	13.5	79.2
	Clark	2	14	13.2	...	18	16.0	...	10	10.4	...
	Defiance	1	14	17.0	86.4	...	...	...	...	...	...
	Delaware	1	33	14.7	80.6	...	...	...	...	...	...
	Fairfield	2	33	13.2	75.9	48	13.9	76.8	18	12.5	74.9
	Fayette	1	24	15.4	80.9	...	...	...	...	...	...
	Fulton	4	23	13.8	83.7	26	16.0	85.3	16	8.9	81.6
	Greene	1	32	11.3	76.6	...	...	...	...	...	...
	Hardin	3	17	14.3	81.9	20	15.6	84.5	14	13.4	78.4
	Henry	1	16	16.2	78.3	...	...	...	...	...	...
	Hocking	2	19	13.1	75.3	20	13.9	77.2	17	12.3	73.3
	Jefferson	1	12	17.7	79.1	...	...	...	...	...	...
	Licking	2	13	13.3	81.7	16	13.5	82.0	10	13.0	81.4
	Lucas	1	22	16.0	82.0	...	...	...	...	...	...
	Morrow	2	36	14.5	71.1	49	16.6	79.0	23	12.4	63.1
	Ottawa	1	29	5.6	...	...	...	...	...	...	...
	Paulding	10	24	13.1	76.5	63	17.3	85.3	9	9.5	65.4
	Preble	1	12	13.3	...	...	...	...	...	...	...
	Putnam	1	16	12.3	80.6	...	...	...	...	...	...
	Seneca	1	19	17.0	81.7	...	...	...	...	...	...
	Shelby	1	43	14.5	79.6	...	...	...	...	...	...

Table showing mean analyses and maxima and minima of the beets examined in the chemical laboratory of the United States Department of Agriculture during 1897, arranged alphabetically by States and counties—Continued.

State.	County.	Number of samples.	Averages. Weight.	Averages. Sugar in the beet.	Averages. Purity coefficient	Maxima. Weight.	Maxima. Sugar in the beet.	Maxima. Purity coefficient	Minima. Weight.	Minima. Sugar in the beet.	Minima. Purity coefficient
			Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*	
Ohio	Stark	3	23	14.9	...	39	16.3	...	12	14.2	...
	Summit	2	20	13.4	73.8	24	16.0	84.4	15	10.8	63.1
	Trumbull	1	19	15.0	79.3	...	...	...	...	...	...
	Van Wert	1	25	11.0	70.6	...	...	...	...	...	...
	Washington	2	40	11.8	77.7	40	12.8	82.7	39	10.7	72.7
	Wayne	8	16	14.7	83.2	26	17.9	89.9	9	12.0	77.8
	Wood	2	18	15.7	78.5	20	18.7	79.5	15	12.6	77.4
Averages, etc		68	22	13.8	79.1	43	17.7	86.4	12	7.4	70.6
Oklahoma	Woodward	1	10	11.8	72.5	...	...	...	...	...	...
Pennsylvania	Allegheny	13	18	13.8	77.0	25	18.4	86.2	10	7.1	72.3
	Crawford	3	25	13.9	75.3	33	17.0	78.7	19	12.3	72.9
	Cumberland	22	12	12.2	79.6	20	17.3	89.2	6	8.6	65.0
	Elk	2	16	13.0	77.4	17	13.5	78.5	16	12.5	76.3
	Erie	7	28	15.8	82.5	45	17.8	86.5	13	13.5	77.3
	Lawrence	2	16	16.8	79.9	19	17.6	80.4	14	16.1	79.3
	Lebanon	1	24	14.4	79.0	...	...	...	...	...	...
	Mercer	2	34	15.4	83.7	34	15.6	84.6	34	15.1	82.8
	Perry	2	31	15.7	82.2	40	17.3	85.3	22	14.1	79.1
	Potter	1	18	18.0	81.1	...	...	...	...	...	...
	Union	1	10	19.6	...	...	...	...	...	...	...
	York	3	25	13.9	80.2	43	14.5	82.7	16	13.7	77.4
Averages, etc		59	18	13.8	79.5	45	19.6	89.2	6	7.1	65.0
Rhode Island	Washington	2	21	11.9	74.2	23	12.3	76.7	18	11.4	71.6
South Carolina	Abbeville	1	13	9.3	...	...	...	...	...	...	...
	Berkeley	1	21	7.5	...	...	...	...	...	...	...
	Charleston	3	29	9.4	...	31	8.0	...	10	3.8	...
	Edgefield	1	15	11.4	...	...	...	...	...	...	...
	Greenville	2	21	12.6	...	25	13.1	...	17	12.0	...
	Lexington	1	16	7.4	...	...	...	...	...	...	...
	Pickens	2	16	13.5	...	22	13.7	...	10	13.3	...
	Sumter	2	12	11.2	...	12	11.5	...	12	10.9	...
Averages, etc		13	17	9.9	79.9	31	13.7	...	10	3.8	...

South Dakota	Beadle □	1	19	14.3							
	Lincoln □	1	14	13.4	80.0						
	Meade □	1	12	15.1							
	Yankton □	2	20	16.5	85.3	22	17.5	87.6	18	15.4	83.0
Averages, etc		5	17	15.1	83.2	22	17.5	87.6	12	13.4	80.0
Tennessee	Knox □	8	4	12.1		7	13.5		1	10.6	
	Maury □	4	16	11.5	72.6	24	14.9	74.1	10	8.9	69.8
	Warren □	2	24	9.5		28	10.6		20	8.3	
	Washington □	1	10	10.9	72.6						
	Weakley □	2	20	5.7							
Averages, etc		17	11	10.8	71.9	28	14.9	74.1	1	8.3	69.8
Texas	Denton □	1	9	13.5							
	Erath □	1	47	11.1							
	Grayson □	1	28	13.0	80.1						
	Hopkins □	1	12	8.8							
	Hunt □	1	6	13.4							
	McLennan □	1	5	13.0							
	Reeves □	4	30	13.6	76.7	33	14.7	79.8	14	11.3	75.1
	Wise □	1	13	11.5	72.3						
Averages, etc		11	22	12.6	76.5	33	14.7	79.8	5	8.8	72.3
Utah	Boxelder □	3	25	11.7	78.4	27	13.4	81.4	22	10.2	73.1
	Cache □	3	17	11.6	78.8	24	15.3	80.0	10	9.1	77.5
	Davis □	3	20	14.0	83.0	26	16.2	85.4	15	10.8	80.2
	Sanpete □	13	21	14,5	81.0	43	16.6	88.2	10	11.1	77.3
	Sevier □	4	16	14.9	78.8	21	16.1	82.0	10	12.9	74.3
	Utah □	6	14	16.7	84.8	16	20.2	90.5	11	13.5	79.2
	Weber □	3	29	13.1	79.3	36	14.9	85.3	16	10.3	70.6
Averages, etc		35	20	14.3	81.1	43	20.2	90.5	10	9.1	70.6
Vermont	Addison □	1	47	10.0							
	Caledonia □	1	29	16.9	85.0						
	Chittenden □	1	9	16.3	86.3						
	Franklin □	1	10	12.7	79.3						
	Lamoille □	1	30	13.2	81.8						
	Windham □	3	16	14.7	85.5	24	15.9	86.9	11	14.0	83.3
Averages, etc		8	22	14.2	84.1	47	16.9	86.9	9	10.0	79.3
Virginia	Albermarle □	1	10	9.7	65.4						
	Appomattox □	2	11	11.2		11	14.3		10	8.1	
	Augusta □	2	17	10.6		20	13.6		13	7.5	
	Bedford □	2	34	6.5		48	7.4		20	5.6	
	Caroline □	2	32	11.1	77.2	40	12.2	82.6	24	9.9	71.7
	Carroll □	1	15	15.4							
	Charles City □	1	19	12.2	77.6						

Table showing mean analyses and maxima and minima of the beets examined in the chemical laboratory of the United States Department of Agriculture during 1897, arranged alphabetically by States and counties—Continued.

State.	County.	Number of samples.	Averages. Weight.	Averages. Sugar in the beet.	Averages. Purity coefficient	Maxima. Weight.	Maxima. Sugar in the beet.	Maxima. Purity coefficient	Minima. Weight.	Minima. Sugar in the beet.	Minima. Purity coefficient
			Ounces.	*Per cent.*		*Ounces.*	*Per cent.*		*Ounces.*	*Per cent.*	
Virginia	Fairfax	2	25	12.4	79.9	31	12.4	83.3	19	12.4	76.5
	Fluvanna	1	19	11.1	78.5						
	Goochland	2	14	13.7	75.4	14	14.0	75.8	13	13.4	74.9
	Hanover	1	23	13.1	73.3						
	Henrico	1	24	6.7							
	James City	1	24	12.4	81.8						
	King William	1	13	13.7	80.9						
	Loudoun	1	7	15.4	72.7						
	New Kent	1	13	12.3	73.3						
	Northampton	4	20	11.6	77.5	26	12.5	79.4	16	10.9	76.2
	Orange	1	21	15.5	76.4						
	Princess Anne	1	19	11.5	78.9						
	Warren	5	31	10.9	73.0	49	14.7	76.5	22	6.3	69.2
	Wythe	1	2	12.2							
Averages, etc		34	21	11.6	76.2	49	15.5	83.3	2	6.3	65.4
Washington	Chehallis	4	48	7.9		66	9.8		36	5.8	
	Clarke	1	23	13.5							
	King	2	25	11.8	81.1	32	11.9	83.0	17	11.6	79.1
	Kitsap	1	58	11.0	76.2						
	Lincoln	5	18	14.6	74.0	25	19.9	81.0	9	9.1	67.0
	Pierce	1	33	13.0	81.4						
	San Juan	1	18	14.4	78.3						
	Skagit	6	26	12.7	76.4	48	15.3	83.4	16	9.9	74.3
	Whatcom	2	23	11.3	77.5	25	12.9	83.3	20	9.6	71.6
	Yakima	11	24	17.0	87.0	33	19.1	89.7	13	15.0	84.5
Averages, etc		34	27	13.7	80.7	66	19.9	89.7	9	5.8	67.0
West Virginia	Grant	1	53	13.5	83.0						
	Hardy	1	20	11.9	69.1						
	Monroe	9	18	16.6	81.8	30	18.9	88.8	6	13.6	75.3
	Morgan	2	8	14.		8	14.5		7	14.1	
	Summers	1	16	12.3	78.2						
Averages, etc		14	19	15.4	80.4	53	18.9	88.8	6	11.9	69.1
Wisconsin	Ashland	1	20	12.7	75.2						
	Clark	1	14	13.9	85.4						

	Dane □	31	11	16.4	84.8	21	19.5	88.2	5	13.4	80.5
	Fond du Lac □	1	34	12.7	78.7	....	....	....	....	....	....
	Monroe □	1	32	11.5	71.4	....	....	....	....	....	....
	Outagamie □	1	8	17.2	86.9	....	....	....	....	....	....
	Racine □	3	34	15.4	82.6	38	15.9	83.9	29	15.0	80.9
	Rock □	1	20	13.2	73.6	....	....	....	....	....	....
Averages, etc	....	42	15	15.8	83.3	38	19.5	86.9	5	11.5	71.4
Wyoming	Albany □	5	12	18.7	86.7	26	22.3	92.1	6	12.2	77.3
	Bighorn □	6	20	18.7	82.2	26	22.7	87.2	13	12.0	70.2
	Converse □	9	26	17.8	82.2	60	24.3	86.3	12	15.6	77.7
	Crook □	1	5	17.1	....	....	....	....	....	....	....
	Fremont □	1	24	12.5	72.0	....	....	....	....	....	....
	Johnson □	3	26	11.3	76.1	33	13.4	76.9	14	9.1	75.2
	Laramie □	4	17	16.0	83.3	24	17.1	86.9	9	14.7	79.5
	Natrona □	2	11	18.5	....	13	19.6	....	8	17.3	....
	Sheridan □	3	12	17.9	....	13	19.6	....	9	16.2	....
Averages, etc	....	34	19	17.2	82.3	60	24.3	92.1	5	9.1	70.2

STUDY OF THE ANALYTICAL DATA.

In further elucidation of the data contained in the preceding tables a brief discussion of them for each State is appended, supplemented by a summary of those secured by the experiment stations in the several States.

ARIZONA.

The samples from Arizona consist of one from Apache County, and six from the agricultural experiment station in Pima County. In the foregoing tables the averages of weight are given to the nearest ounce to avoid the fractions of an ounce, which would necessarily increase the space required for printing. Inasmuch as the weight of the cut beet is so easily varied by a slight difference of the position of the knife in cutting, it is evident that this method of estimation is practically sufficient.

In the analytical data obtained from Arizona, as will be seen by referring to the preceding data, the mean weight of the beets examined was 23 ounces and the mean percentage of sugar in the samples 9.3. On account of the poor quality of the beets, the purity of the juices was not determined. The highest observed percentage of sugar in the beet was 12 and the lowest 7.6.

The following report of his investigations and observations in regard to the sugar beets grown in Arizona, during the season of 1897, was made by Robert H. Forbes, chemist of the Agricultural Experiment Station of Arizona.

RESULTS OF EXPERIMENTS WITH SUGAR BEETS IN ARIZONA FOR 1897.

By R. H. FORBES, Chemist.

Briefly stated, the average for 157 analyses of beets from all over the Territory is 8.56 per cent of sugar in the juice, with a purity of 61.8. At first glance these are discouraging figures indeed, but taken as they stand they are misleading, and their true significance can only be gotten at by examining the whole series of analyses for differences due to the effect of such important factors as care and skill in growing, different kinds of soil, differences of climate found in various localities and at different times of the year, and the variety of beets planted.

In order to show the results of careful cultivation upon the quality of the beets, I have divided the samples received from Salt River Valley into three lots.

The first lot consists of 13 samples grown by Dr. Claflin on the experimental substation grounds near Phœnix. These beets were given the most excellent care. The second lot consists of 24 samples obtained from 12 growers near Phœnix, Glendale, and Mesa. These beets received a fair amount of care during growth, but on the average were probably not as carefully attended to as Dr. Claflin's 13 samples. The third lot consists of 60 samples from the same localities, but which were cared for scarcely at all excepting for an occasional irrigation. The results speak for themselves. Dr. Claflin's 13 samples averaged 11.23 per cent of sugar in the juice with a purity of 68.3. The 24 cultivated samples from other growers averaged 9.42 per cent of sugar in the juice, with a purity of 66.3. The 60 neglected samples gave 8.35 per cent of sugar in the juice, with a purity of 53.4.

These figures confirm the well-known fact that intelligent and skillful care is essential in beet culture; more so, I dare say, than in the production of any other great staple, and careless or ignorant treatment of our vegetable thoroughbred will

inevitably end in disaster. The sugar beet is no exception to the well-known rule that plants, which have been developed through cultivation, if neglected or allowed to run wild, quickly return to their former primitive condition.

Because of the unusual facility with which the sugar beet returns to its former unprofitable condition, it is evident that beet culture is a high art, and in this country the more intelligence is required in its treatment because the conditions are in many ways unusual, and the rules which are successfully applied in other countries must be changed or modified here.

In a general way, however, we may insist that deep and thorough preparation of the soil, careful irrigation, and repeated cultivations and hoeings as long as the crop will permit are no less essential here than elsewhere.

The effect of climate is also perceptible in our analyses. Samples have been received from St. Johns, St. Joseph, Holbrook, Duncan, Buckeye, Thatcher, Skull Valley, Tombstone, Taylor, Fort Thomas, and other more elevated or more northerly points. Almost without exception, the beets from these places were much above the average in richness and purity. The richest samples we have as yet received came from St. Joseph and contained 16.3 per cent of sugar in the juice, with a purity of 81; 17 samples received from the above places averaged 12.37 per cent of sugar in the juice, with a purity of 75.5.

In order to make the comparison more rigid, we select the Kleinwanzlebener variety only from among them, and find that 7 samples average 12.4 per cent sugar, with a purity of 76.3, as against 10.22 per cent sugar and a purity of 67.82 for this same variety in Salt River Valley.

Knowing the great influence of temperature upon the composition of the beet, it is difficult to lay these differences to any other cause than the cooler temperature of these higher and more northerly localities.

It is a matter of regret that arable land is so scarce in these parts of the Territory. Our observations, however, may guide us in obtaining better results in warmer localities, and in this way: Most of the Salt River Valley plantings were made in March and April, so that almost from the start the plants were subject to the hot summer weather, the temperature throughout the months of June, July, August, and September being much above the point generally regarded as most favorable to sugar beets. Now, it is possible that by planting earlier in the year a cooler temperature may be secured for the first three or four months of the life of the plants. Of course the risk from frost will be increased, but that there is some possibility of success in the plan is suggested by the fact that on June 14 we analyzed a sample of beets from Fowler Brothers, near Phœnix, which gave 15.2 per cent of sugar in the juice, with a purity of 76. The seed for this lot was planted February 12 and the beets were probably not mature.

We can not safely draw conclusions from a single instance, but the high percentage and purity in this extremely early sample are suggestive of the possible advantage in early planting.

Selecting the Kleinwanzlebener beets received from the northern places and comparing them with those obtained from Phœnix, Glendale, Tempe, and Mesa, in the Salt River Valley, we obtain the following results:

Showing effect of climate.	Average weight of beets.	Sugar in juice.	Sugar in beets.	Purity coefficient.
Kleinwanzlebener:	*Ounces.*	*Per cent.*	*Per cent.*	
From more northerly or elevated localities, 14 samples	18	13.35	12.35	78.8
From Salt River Valley, 18 samples	18.2	10.48	9.69	69.5

The average mean monthly temperatures for Phœnix, Prescott, and Fort Thomas during several years past are shown in the following table. Phœnix is in the Salt River Valley, Prescott represents the cooler northern parts of the Territory from

which beets were received, and Fort Thomas is in the fertile, irrigated portion of Graham County, in Southeastern Arizona.

	Mean temperature.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Phœnix	49	54	61	67	74	82	90	88	80	70	61	55
Prescott	34	38	44	51	59	66	74	72	65	54	42	39
Fort Thomas	47	48	55	61	70	79	86	83	75	62	49	44

Finally, as to the soil, it is much more difficult to trace any connection between the quality of beets produced and the numerous varieties of soil, for which this region is famous and on which they have been grown. Fortunately, however, we have recently completed the analysis of a series of twenty representative Salt River Valley soils and certain general characteristics of the soils of this region have been determined.

From a chemical point of view the following statements may be made about five of the most important soil constituents, viz, potash, lime, nitrogen, phosphoric acid, and humus.

Potash is everywhere present in abundant quantities. We have found from 0.47 to 1.96 per cent in our samples, the lower figure being ample for a fertile soil.

Lime also is present in great sufficiency, the samples showing from 0 57 to 4.2 per cent.

Nitrogen, however, is deficient almost everywhere, the average for the series being 0.048 per cent, and in only two instances rising above 0.10 per cent, which is considered to be a needful amount to insure nitrogen fertility.

This deficiency probably affects the richness of sugar beets less than it does their size. It is well known that an excess of nitrogen produces beets of an enormous size, but of very poor quality. In one instance we received a beet weighing 5 pounds, which had been grown on heavily manured and abundantly irrigated soil. The sample gave only 1.7 per cent of sugar in the juice, with a purity of 23. This result was probably due, in part at least, to excessive nitrogen.

The small average size of the beets received, however, points to a poverty of nitrogen in the soil for this crop. This will hold for other crops as well as beets, and I am told that in one case near here two neighboring orange orchards were planted, one on virgin mesa soil, the other on plowed alfalfa ground. It is stated that the latter orchard has prospered far more than its neighbor. This was doubtless due to the nitrogen which alfalfa and other leguminous crops contribute to the soil. In selecting beet ground, therefore, other things being equal, it would be well in this region to choose that which has previously been in alfalfa.

In support of this view I would state that Dr. Claflin's samples were grown on ground that had previously been in alfalfa, so that his excellent record may have been due in part to this cause.

Phosphoric acid is usually present in sufficiency, though never very abundant. In some cases a serious lack of phosphoric acid has been noted. The average for the valley is 0.13 per cent. It is stated that the effect of phosphoric acid in beet culture is to increase the sugar and hasten maturity. It is supplied to advantage in connection with nitrogen, this combination tending to increase the size of the beets and also maintain their richness.

This desirable combination of nitrogen and phosphoric acid is found in guanos and in bone superphosphates, and it is probable that the application of these fertilizers will, so far as beet culture is concerned, greatly improve the soils of this region. The question of cost, of course, enters here, but it is one which must in any case soon be solved. At Chino, Cal., with an exceedingly fertile soil, the need of commercial fertilizers is already felt, after the lands having been cropped for five or six years.

Barn manure is of value for beets only after other crops have been grown on the land, and the manure thereby thoroughly incorporated with the soil. If applied just before planting the beet seed, it will prove injurious both to the stand of plants and the quality of the product.

Humus, or vegetable matter, is deficient in all arid soils, our own among the number. Humus and lime are valuable largely because they impart better tilling qualities to the soil, give it greater water-holding power, and lessen the tendency to hardness when dry. Humus results from barn manure, and the application of this material with suitable precautions should be beneficial.

As to alkali and its effect upon beets, it may be said that when the plants are once established in thrifty growth they will stand more alkali than most other crops. It has been observed also at Chino that the quality of the beets is not impaired by alkaline ground. It is probable, however, as a matter of opinion, that young plants are injured by the crust formed on the surface of the soil through the action of alkali, and this may account in part for the exceedingly poor stand of plants obtained in most of the experiments this year. Almost without exception, the reports state that the seed did not come up well or that the young plants died. This difficulty may possibly be overcome by planting earlier in the year, by using more and better seed, and by taking more care to keep the surface soil loose during the germination of the seed and the first weeks of plant growth. Salt River Valley is not excessively alkaline; much less so, it is stated, than the Pecos Valley in New Mexico, where beet culture is now attempted.

So much for the result of one season's experimental work. The lessons we have learned are: (1) That here as elsewhere sugar beets must be grown with the utmost care; (2) that the cooler portions of the Territory, so far as observed, produce better beets than the warmer localities, and that experiments should be made as to what early planting will do in these warmer localities; (3) that the Kleinwanzlebener variety, so far as yet known, yields the best results in Arizona; and (4) that the soils of the valley stand in need of nitrogen and organic matter, possibly phosphoric acid also, and that previous occupation of the ground with alfalfa or other means of fertilization should be secured.

Though many of the results are unfavorable, the occasional successes that have been secured show that there is ample reason for a continuance of the work.

If, during the next year, a half dozen first-class farmers of this valley will each put in an acre of Kleinwanzelebener beets early in the year, on ground that has been in alfalfa, and will care for them as they ought to be cared for, I believe that we may have something much more favorable to report on this subject.

Further details of the above experiments with beets are published in Bulletin No. 26 of the Arizona experiment station, issued in December, 1897.

The poor results obtained in Arizona are somewhat surprising, although in general it may be said that the climate of Arizona is too warm for securing the best results. The remarks made by Mr. Forbes in regard to careful culture should be given due consideration. The probabilities are, however, that inasmuch as the beets in Arizona were all grown with irrigation, the application of the water was of such a character as to prevent, in some respects, the development of the highest saccharine content. It may be remarked in general, in regard to the beets grown with irrigation, that much is yet to be learned in regard to the manner of supplying the water, the time at which it is to be applied, and the quantity which is to be used. It would be expected that the ideal conditions of moisture could be secured by irrigation, and yet in practice the results have not been the most encouraging.

This has been true in regard to the growth of beets in Utah and New Mexico under irrigation. There is no factor connected with the sugar-beet industry which is of more practical interest than a careful study of the conditions under which irrigated beets should be grown. The fertile soils of the arid regions are undoubtedly able to produce large crops of beets under irrigation, when the proper conditions are understood. Complaints have also been made in respect of the effects of alkali upon beets in these soils, and also of insect pests. It is important that a study be made of the bacteria, molds, and insect pests of sugar beets, together with the effects of the alkali. After allowing for all these conditions, however, it must be confessed that the Arizona data are somewhat disappointing, and unless great improvement can be made there is little prospect of the industry being established on a secure foundation in that region.

Arkansas.

Arkansas lies so far south of the beet belt as to make a discussion of the possibilities of beet growing in that vicinity unnecessary. Only two samples were received from the State, and as might be expected, these do not show any very favorable qualities. A few general remarks may be made about growing beets in warmer climates than those best suited to obtaining the highest grade of beets, namely:

First, that it is quite possible to get fine harvests of beets with favorable tonnage per acre,

Second, that it is possible to grow beets containing quantities of sugar which would have made them valuable for manufacturing purposes several years ago, before the beet reached its present high state of development, and

Third, that such beets could probably be grown with great profit for stock-feeding purposes in all these localities. The full value of the beet and beet pulp will be discussed in a separate portion of this report.

The average weight of the two samples received from Arkansas was 18 ounces, and the average content of sugar in the beet 11.3 per cent.

California.

California is recognized as the principal beet sugar producing State in the Union. Only one sample of beets was received from this State, and it had a weight of 26 ounces and contained 16.8 per cent of sugar. All of the coast valleys of California are favorably situated, in respect of temperature, for the production of sugar beets, and the same may be said of certain lands, the limits of which are not yet well defined, in other parts of the State. Even in the Sacramento Valley, as far inland as the point of junction with the San Joaquin River, where the temperature is higher than that considered best for beets, it has been found that good beets can be grown. In experiments conducted on Union Island, near Stockton, Cal., during the years 1884–85, under direction of the chief chemist of the Department of Agriculture, very

encouraging results were obtained, both in the quantity and the character of the beets produced. These beets were grown upon the reclaimed lands of the delta of the San Joaquin at its junction with the Sacramento River. The lands were protected from overflow by strong levees, but the conditions were not theoretically the most favorable for the production of high-grade beets.

Unfortunately, however, large portions of the coast lands, by reason of their contour, are not well suited to the cultivation of beets. On page 90 of Bulletin No. 5 of the Division of Chemistry, published in 1885, the following observation is made: "In the interior and eastern divisions of California only the high Sierra regions have a temperature low enough for beets, and in that locality there is no land adapted to beet culture. The beet region of California, therefore, is confined to the coast valleys." This statement may have to be modified to some extent by reason of the data mentioned above from Union Island. These observations are corroborated by the analyses made by Director Hilgard, during 1897, of beets grown in Sacramento County. This locality adjoins Union Island, where the experiments conducted by the Department of Agriculture were made. The average size of the beets examined by Director Hilgard was satisfactory, and the content of sugar in the beets was a little over 16 per cent, with a high purity reaching almost 85 for a whole series of analyses. These data show that in the Sacramento Valley, at least where the temperature is somewhat higher than that regarded as most favorable, beets of fine sugar-producing qualities can be grown. After a careful personal study of the climatic and soil conditions in California, made in 1884, it is stated on page 100 of Bulletin No. 5 of the Division of Chemistry that there are in California about 5,830 square miles of land suitable to beet culture, provided the whole of it could be supplied with a sufficient quantity of water. Even if only one-third of this area should be found eventually fit for the culture of beets, it would be possible for the State of California alone to produce nearly 500,000 tons of beet sugar and still practice a proper rotation of crops. In view of the fact that the beet-sugar industry has been so carefully studied in California, both by the agricultural experiment station and by those engaged in the manufacture of sugar, it is not necessary here to dwell further upon the possibilities of its extension in that State.

COLORADO.

The number of samples received from the State of Colorado at the Department of Agriculture was 174. The average weight of the beets received was 20 ounces, the mean percentage of sugar in the beet 13.6, and the mean purity 76.7. The conditions which obtain in Colorado are so different from those of the Eastern States as to warrant a detailed discussion of the data. This, however, in the present condition of affairs, would be somewhat premature. It is advisable to wait until a more thorough agricultural survey of the State be made, under the immediate supervision of the agricultural experiment station. When

the analytical table of the data received from Colorado is consulted, it is seen that most remarkable differences exist in the returns from the different counties. Since in most cases only a very few samples have been received from any given county, it is not fair to make any judgment of the possibilities of any one county from data of so limited a nature. The great variations in altitude in the State, causing sharp differences of temperature, must also be taken into consideration. In addition to this, it is fair to presume that the samples have all been grown under irrigation, and it is impossible, in such data as are collected from the farmers, to determine with any certainty what the proper conduct of the irrigation should be. In general, the data are entirely satisfactory, especially in respect of content of sugar. As regards the mean purity of the juices, the data are somewhat unsatisfactory, since it falls more than three points below the minimum of good beets. This may be due to the great amount of mineral salts which the soils of Colorado contain, and to the well-known property of the sugar beet of absorbing these salts from the soil. For this reason, it may be suggested that in many cases cultivation of the sugar beet could be advantageously practiced, not alone on account of the profit in the beet itself, but because of the improvement in the soil which would result from the extraction of the alkaline materials. Among the counties where the samples have been somewhat numerous and the results most encouraging may be mentioned Boulder, lying to the northwest of Denver and mostly within the favorable thermal area, where the average content of sugar in the beet was over 15, and the purity nearly 81. This most favorable result was obtained with exceptionally large beets, the average weight of which was 31 ounces. This fact makes the data even more valuable and suggestive.

Another county where the data were extremely favorable, although the number of samples was only two, is Delta, a county lying within the theoretical thermal area, and where the average size of the samples was 20 ounces, the average content of sugar over 17, and the purity 80.5.

Another favorable result may be reported from Garfield County, although the average size of the beets is a little low. The mean percentage of sugar in the beets was 16.6, and the purity 83.2. This county also lies mostly in the thermal belt.

In contrast with the above should be cited the returns from Logan County, showing not only small beets, but exceptionally low contents of sugar and purities. Logan County, nevertheless, is contained almost wholly within the thermal belt, which is most favorable to the growth of beets. The poor results obtained must therefore be due to causes which are not made known.

Upon the whole, the data from Colorado are exceedingly encouraging and lead to the belief that there are many parts of that State where, with proper conditions of tillage and irrigation, the sugar beet industry may be established with profit.

In connection with the work done by the Department of Agriculture,

it is interesting to consider the report of the director and chemist of the agricultural experiment station of Colorado at Fort Collins:

BRIEF REPORTS REGARDING SUGAR BEET EXPERIMENTS FOR THE YEAR 1897, AT THE COLORADO STATE AGRICULTURAL COLLEGE.

Chemical section.

The work of the chemical department on sugar beets can be summarized briefly as follows:

We began taking weekly samples on September 2. The varieties represented were Vilmorin, two plots; Kleinwanzlebener, two plots; Leon Brand,[1] one plot; and Imperial, one plot. The amount of sugar in the beets was determined from week to week. We did not find a very rapid increase as the season advanced until the beets approached maturity, when we observed a sudden increase of about 3.5 per cent. Our samples varied greatly in their sugar content, but agreed in indicating that the crop in this country was not sufficiently matured to yield marketable beets before the middle of October. The average of the beets analyzed subsequent to this date, debarring one lot, the most of which were grown under unfavorable conditions, and a few samples which were clearly unmarketable beets, is 14 per cent, the range being from 10 per cent to 18.25 per cent of sugar. The coefficient of purity has ranged from 70 to 89, and has averaged 80.7. We believe the average percentage of sugar given to be high enough, but the coefficient of purity—80.7—is lower than the actual coefficient rather than higher.[2]

Respectfully submitted.

WILLIAM P. HEADDEN,
Station Chemist.

Agricultural section.

(From Report of the Director.)

In a general way it can be said that the results of this season's work are very favorable to the establishment of the beet-sugar industry in Colorado. The following figures are to be judged in the light of the statements that come from all the beet-sugar manufacturing States of the Union, that the season of 1897 was especially unfavorable to the industry. If in this poor year Colorado can make such a good showing, what may we expect of her in ordinary or favorable years?

The above report of the chemist of our Experiment Station gives the figures for the beets raised on the College Farm. But few analyses were made here of beets raised elsewhere, since the failure to get into our new chemical building last fall left the Chemical Department in poor shape for doing much outside work.

Practically all the analyses of Colorado beets not grown at Fort Collins were made in the Chemistry Division of the Department of Agriculture at Washington. It has seemed best to give here merely a summary with reference to our local conditions.

For the purpose of sugar-beet raising Colorado may be divided into five sections:

(1) The valley of the South Platte and its tributaries.

(2) The divide south of Denver, and the plains region where beets are grown without irrigation.

(3) The valley of the Arkansas River.

(4) The valley of the Grand River.

(5) The San Luis Valley.

All these, except the second, use irrigation. There are two features of the raising of sugar beets that require special study—namely, the quality of the beets when they are ripe and the time of the year when they reach that degree of ripeness. The

[1] This variety is unknown to me.—H. W. W.

[2] It is not clear what is meant by this expression.—H. W. W.

earlier in the season they reach a profitable degree of sugar and purity the longer season the factory will have to manufacture the crop, and the larger the amount of crop that can be handled by a factory of a given size.

Many tests were made of sugar beets dug in September, but only a few showed beets suited for use in sugar making. Nevertheless, the fact that a few samples, even by September 18, exceeded 12 per cent sugar and a purity of 80, shows that when our farmers are more used to growing sugar beets they can bring them to maturity several days, and probably two weeks, earlier than the average crop of 1897. With the first days of October the crops ripened rapidly.

The following table presents a summary of the season of 1897, with reference to the quality of the beets, and the time of ripening in different parts of Colorado:

Section of State.	Samples dug between Oct. 1 and 10.		Samples dug between Oct. 10 and 15.		Samples dug after Oct. 15.	
	Sugar.	Purity coefficient.	Sugar.	Purity coefficient.	Sugar.	Purity coefficient.
	Per cent.		*Per cent.*		*Per cent.*	
The valley of the South Platte	14.1	80.7	14.6	81.1	15.4	81.1
The divide and the plains	12.5	73.7	15.1	80.6	14.8	78.3
The valley of the Arkansas	....	....	13.1	77.9	15.3	81.9
The valley of the Grand	16.3	83.6	....	....	....	....
The San Luis Valley	13.7	79.2	12.4	78.5	14.8	80.3

IDAHO.

The number of samples received at this laboratory from the State of Idaho was only seven, representing two counties. The average weight of the beets received was 21 ounces, the average content of sugar therein 15.5 per cent, and the average purity 79.4. Both in respect of size of the beets and content of sugar the results are very encouraging. The average coefficient of purity is almost up to the minimum standard, and doubtless could be improved later on. The alkalinity of the soil, which has been mentioned in connection with the lowering of the average in Colorado, is doubtless active in Idaho. There are large areas in Idaho where the thermal conditions are favorable, but they are detached from the main thermal belt crossing the continent. There are two centers of thermal conditions in Idaho which serve as nuclei for determining the conditions most favorable. One of these lies almost wholly in the State, and Boise City may be regarded as the center of it, and the other extends into the western and northern part of the State from the State of Washington. In general, it may be said that the thermal conditions in Idaho, if they alone are to be considered, are sufficiently favorable for the culture of the beet, in so far as the growing season is concerned. The data obtained, while meager, are sufficiently encouraging to warrant a more thorough survey of the State, and also the belief that the conditions for the successful establishment of the sugar industry may be found wherever the character of the soil, in respect of contour and fertility, and the facilities for irrigation and other factors favorable to the growth of the sugar beet and the manufacture of sugar can be secured. The report of the chemist of the station contains much valuable information in respect of the sugar-beet industry in the State of Idaho, and is herewith appended:

RESULTS OF EXPERIMENTS IN IDAHO.

In the first place, the results of the past season are quite disappointing and unsatisfactory, due to several causes which will be eliminated largely in the experiments of next year.

The climatic conditions of Idaho are quite varied, the growing season opening several weeks earlier in South Idaho, along the Snake River and in the Boise Basin, than along the Clearwater or in North Idaho. The seed furnished gratis to this station by the Department of Agriculture arrived late, and before it could be distributed—May 4 to June 2—the season was well advanced, hence the seed that was planted either failed of germination, or the young plants were killed by severe climatic changes of heat and drought, or of cold and wet soil, which latter condition prevailed in the Palouse region. Much of the seed sown in our station plats failed to grow. The stand was irregular, weak, and of poor quality, so that the tonnage per acre could not be estimated with any degree of reliability. It is therefore omitted from the tables.

Seed was mailed to 114 farmers, representing 41 different sections of the State, yet samples of beets for analysis were received at this Department from only 20 farmers, representing 13 localities. This apparent apathy on the part of our farmer friends is explainable in part: In many cases the seed did not reach its destination, or when planted it failed to germinate, or the young plants were destroyed by insects or jack rabbits. In a few cases there was not sufficient interest manifested in the experiment to induce proper cultivation of the young plants, therefore no samples worthy of shipment were grown.

Sugar-beet growing is a new industry to the American farmer, and he has yet to learn that the ordinary farm methods are not always applicable and sufficient to grow and mature a typical sugar beet. The Idaho rancher is not an exception. He has yet to learn the value of intensive methods, from the preparation of the seed bed to the marketing of his crop. The neglect to plow deeply, to pulverize finely, to place the seed with care, to thin the plants judiciously, to cut out the weeds, withal to cultivate and hoe the growing plants regularly, resulted in partial or entire failure of the experiment. The sugar beet is a thoroughbred, and must be given care in keeping with its regal characteristics if high sugar content and purity are to be attained. The successful sugar-beet grower has learned that the sucrose is practically hoed into the root. This knowledge and its application our farmers evidently were not in possession of, or the number of samples forwarded would have been greatly augmented. It is a matter of education, however, which will be overcome in time by the dissemination of information through the press, the station bulletin, and closer competition induced by immigration from older States, where better methods of farming prevail.

The 41 samples analyzed averaged in sugar content 15.17 per cent; in purity, 87.55. The 20 samples grown by the Station gave in sugar 15 28 per cent; in purity, 92.55. The 21 samples grown elsewhere averaged 15.07 per cent of sugar, and 82.78 in purity. The highest and lowest results gave 19 and 10.2 per cent in sugar; and 95.10 and 81.81 purity, respectively.

OTHER SUGAR BEET DATA NOT HITHERTO GIVEN TO THE GENERAL PUBLIC.

During the fall of 1894, 192 analyses of sugar beets were made by the Station, which gave an average of 13.7 per cent of sugar and a purity of 76.08 degrees. Some of the samples were large, others had been frozen, still others were immature, while a few varieties were not at all adapted to our soil and climate. This reduced an otherwise much higher average. Excluding about 20 samples, the remainder, 55 samples of Vilmorin's Improved gave an average of 11.77 per cent of sugar and a purity of 75.55 degrees.

Forty-four samples of Kleinwanzlebener beets averaged 14.16 per cent of sugar with a purity of 82.80.

Thirty samples of Imperial averaged in sugar 14.1 per cent, in purity, 85.42.

Ten samples of French Red Top gave an average of 13.65 per cent of sugar with a purity of 82.70.

The average of 10 samples of Lane's was 13.44 per cent of sugar with a purity of 81.69.

Eight samples of New Danish gave an average of 13.83 per cent of sugar and a purity of 81.81.

The highest and lowest percentages of sugar in each variety were as follows:

Variety.	Highest.	Lowest.
	Per cent.	*Per cent.*
Vilmorin's	16.6	14.4
Kleinwanzlebener	19.6	14.6
Mette	18.4	14.6
Imperial	18.2	10.6
Lane's	15.7	10.6
Red Top	15.9	10.7
Danish	15.2	10.8

The places represented in the experiment were the University of Idaho, Cœur d'Alene, Sand Point, Moscow, Kendrick, Lenville, Princeton, Cornwall, Genesee, substation at Grangeville, substation at Idaho Falls, substation at Nampa.

The average yield throughout the State was estimated at 20 tons per acre.[1]

ANALYSES OF BEETS GROWN IN 1895.

The experiments in sugar beets for 1895 were covered by 342 analyses of beets grown by the University of Idaho and by farmers residing near Grangeville, Nampa, Moscow, Weippe, Vollmer, Palouse, Spokane Bridge, Westlake, Starner, Newport, Salmonn, and Paris.

The average sugar content of the crop was 15.19 per cent; coefficient of purity, 79.91. In the analyses were included 15 samples of red or table beets. These 15 contained an average of 13.75 per cent of sugar in the juice and a coefficient of purity of 75.57.

Several analyses were made for the purpose of determining what bearing, if any, the size of the sample beet had upon the sugar content and purity. Among others I select four varieties, and submit the results without comment:

VILMORIN'S IMPROVED.

Size.	Weight.	Sugar in beet.	Purity coefficient.
	Ounces.	*Per cent.*	
1. Large	21.4	14.02	79.96
2. Medium	15.2	14.31	81.26
3. Small	7.8	14.07	78.58

FLORIMOND DESPREZ.

1. Large	28.7	14.35	83.95
2. Medium	16.5	14.46	84.00
3. Small	10.7	14.10	80.25

LANE'S IMPERIAL.

1. Large	24.1	13.62	80.92
2. Medium	13.3	13.69	82.17
3. Small	8.0	13.38	82.07

KLEINWANZLEBENER.

1. Large	26.0	14.00	84.13
2. Medium	17.0	14.06	84.72
3. Small	13.0	13.74	83.93

[1] This estimate, as is usual in such cases, is doubtless too high.—H. W. W.

ANALYSES OF BEETS GROWN IN 1896.

The work of the year was confined very largely to the station, and consisted of a special effort in the way of growing typical sugar beets. The effect of deep and shallow plowing, regular cultivation, fertilization, and irrigation, as compared with the average treatment given the root under natural conditions as to soil, moisture, and cultivation, was noted. The seed bed was prepared and the seed sown from the 21st to the 30th of May. Very heavy rains prevailed on June 5 and again on June 9. All of the seed had germinated by June 11. The average per cent of stand June 5 was 10.7; June 24 it was 29; one month later it had reached 61.8 per cent. The crop was harvested and analyzed during October. The number of analyses made was 60; the per cent of sucrose in juice was 14.18; coefficient of purity, 77.30; yield per acre, 48,510 pounds.

The sugar-beet experiments connected with this station during 1894, 1895, 1896, and the inauguration of the work of 1897 were under the direction and control of the Agricultural Department, the chemist being responsible only for the analytical data. In July, 1897, under the redistribution of the powers of the station staff, the rather unsatisfactory data thus collected were assigned to the chemical department for compilation and publication, together with the power of supervision of such experiments in the future.

METEOROLOGICAL RECORD.

The better to understand the possibilities of the sugar-beet industry in the Palouse country of Idaho, as well as other experiments that may hereafter be undertaken by the station upon the "university farm," the following meteorological data are included in this report. We are under obligations to Prof. J. E. Bonebright, meteorologist of the station, for the results tabulated:

TABLE 11.—*Meteorological record for Moscow.*

Month.	Maximum temperature.	Minimum temperature.	Average temperature.	Humidity.	Rainfall.	Days fair.	Days clear.	Days cloudy.
1894.	°	°	°	*Per cent.*	*Inches.*			
April	76.0	25.0	47.40	76.0	1.38	8	7	15
May	86.0	30.0	57.40	63.0	1.53	7	15	9
June	84.0	32.0	62.00	74.0	1.23	3	19	8
July	93.0	40.0	78.00	65.0	.12	2	29	0
August	96.0	34.0	70.50	46.0	.25	3	26	2
September	85.0	32.0	58.80	72.0	.89	2	25	3
October	74.0	28.0	40.40	85.0	3.70	9	9	13
1895.								
April	76.0	26.0	48.10	70.0	1.30	5	12	13
May	81.0	30.0	51.90	68.0	2.17	2	22	7
June	96.0	33.0	59.40	52.0	.41	....	....	....
July	92.0	41.0	72.70	38.0	.90	1	29	1
August	94.0	33.0	74.50	47.0	.32	3	26	2
September	84.0	28.0	49.80	70.0	3.33	2	20	8
October	74.0	21.0	46.10	72.0	Trace.	2	27	2
1896.								
April	68.0	26.0	42.53	....	.57	12	10	8
May	84.0	31.0	46.50	85.5	3.60	4	13	14
June	92.0	34.0	61.10	61.7	2.21	0	30	0
July	97.0	14.0	70.41	55.6	.17	0	30	1
August	93.0	38.0	67.17	55.4	1.33	0	26	5
September	85.0	30.0	54.65	72.2	.81	0	22	8
October	76.0	28.0	46.33	....	1.07	2	17	12
1897.								
April	63.1	36.5	49.70	72.2	.40	0	19	11
May	78.8	38.8	....	....	1.20	0	21	10
June	65.6	46.0	53.80	77.4	2.72	0	25	5
July	82.0	48.5	70.00	45.4	.85	0	26	5
August	81.6	46.4	71.50	40.3	.35	0	30	1
September	69.9	38.4	59.20	77.6	1.67	0	22	8
October	66.4	36.4	....	....	1.10	3	22	6

ILLINOIS.

The samples received from the State of Illinois by the Department of Agriculture were 32 in number. The average weight of the samples was 17 ounces, percentage of sugar 13.1, and the purity 75.5. Twelve of these samples were from the northern, 8 from the central, and 12 from the southern belt.

When judged by the few samples analyzed by the Department of Agriculture, it is seen that Illinois presents an exception to the established rule, inasmuch as the beets grown in the northern belt are inferior to those grown in the central belt. The data, however, are not numerous enough to base any certain conclusions upon them, and the usual rule is established from the more numerous analyses conducted by the agricultural experiment station, as will be seen farther along. Summarized, the results obtained at the Department of Agriculture from the northern, central, and southern belts in Illinois are as follows:

Summary of analyses of sugar beets from Illinois.

[Compiled from analyses of the United States Department of Agriculture.]

	Number of samples.	Average weight.	Sugar in beets.	Purity coefficient.
		Ounces.	*Per cent.*	
Northern belt	12	19	12.6	76.2
Central belt	8	20	13.8	76.5
Southern belt	12	13	13.2	73.3

At the agricultural experiment station of Illinois, at Urbana, 312 samples of beets were received and analyzed. The following summary shows the analytical data and the distribution of the samples by counties:

Summary of analyses of sugar beets from Illinois, by counties.

County.	Number of samples.	Average weight.	Sugar in beets.	Purity coefficient.	County.	Number of samples.	Average weight.	Sugar in beets.	Purity coefficient.
NORTHERN BELT.					CENTRAL BELT.				
		Ounces.	*Per ct.*				*Ounces.*	*Per ct.*	
Stephenson	1	20	10.7	70.0	Kankakee	8	24	12.9	79.3
Winnebago	2	18	13.4	75.8	Henderson	1	22	9.2	70.8
McHenry	1	19	15.1	84.3	Knox	4	20	11.0	75.1
Carroll	4	20	13.8	81.4	Stark	1	10	14.4	78.3
Whiteside	6	22	13.9	79.2	Peoria	4	24	13.0	80.1
Ogle	3	23	12.6	74.6	Marshall	1	18	14.3	81.9
Lee	8	16	13.8	80.6	Woodford	1	22	13.3	82.1
Dekalb	7	20	13.4	78.3	Livingston	3	17	14.0	82.9
Dupage	1	21	15.6	82.2	Iroquois	50	20	11.3	75.3
Cook	3	24	14.3	82.7	Hancock	1	17	10.6	64.0
Rock Island	1	16	14.9	82.5	Fulton	1	17	11.2	77.1
Henry	6	18	12.7	78.3	Tazewell	2	20	12.3	78.8
Bureau	3	33	10.5	76.5	McLean	5	24	12.0	77.6
Lasalle	31	22	13.1	76.4	Ford	1	24	10.8	77.0
Kendall	2	14	13.8	82.8	Adams	4	17	12.4	75.5
Grundy	1	18	13.9	80.2	Mason	25	19	11.1	75.7
Will	23	28	12.9	74.6	Logan	4	29	9.8	69.6
Mercer	1	17	12.6	79.7	Dewitt	1	27	13.8	81.7

Summary of analyses of sugar beets from Illinois, by counties—Continued.

County.	Number of samples.	Average weight.	Sugar in beets.	Purity co-efficient.	County.	Number of samples.	Average weight.	Sugar in beets.	Purity co-efficient.
CENTRAL BELT—continued.		*Ounces.*	*Per ct.*		CENTRAL BELT—continued.		*Ounces.*	*Per ct.*	
Macon	1	18	8.0	64.9	Clark	4	11	13.6	73.9
Piatt	2	20	12.7	81.0					
Champaign	10	21	11.7	79.6	SOUTHERN BELT.				
Vermilion	2	19	11.3	75.2					
Pike	1	10	9.6	69.4	Effingham	1	10	12.6	74.6
Scott	1	10	9.7	64.3	Madison	15	21	10.3	74.0
Morgan	4	22	10.3	74.3	Bond	1	18	10.3	80.8
Sangamon	2	17	11.2	76.8	St. Clair	11	21	12.3	77.7
Christian	2	19	11.8	76.5	Washington	1	16	11.9	75.2
Shelby	3	21	10.9	71.9	Jefferson	1	14	12.1	85.0
Douglas	3	24	11.2	77.5	Wayne	1	16	14.3	77.0
Edgar	2	16	12.1	74.9	Clay	1	15	11.8	68.3
Calhoun	2	14	9.4	72.1	Edwards	1	15	8.7	58.7
Greene	3	14	8.5	68.3	Jackson	2	17	10.8	73.8
Macoupin	6	17	11.6	72.2	Saline	3	10	9.3	68.9
Montgomery	5	11	13.0	76.9					

The average weight of the beets received was 20 ounces, the mean percentage of sugar therein 11.9, and the mean purity 76.4. Distributed geographically into northern, central, and southern sections, we find each of the sections represented by the number of samples of the mean average composition indicated in the following summary:

Summary of analyses of sugar beets from Illinois.

[Compiled from the experiment station report.]

	Number of samples.	Average weight.	Sugar in beets.	Purity co-efficient.
		Ounces.	*Per cent.*	
Northern belt	104	22	13.2	79.3
Central belt	165	20	11.5	75.4
Southern belt	43	19	11.1	74.7
Average, etc	312	20	11.9	76.4

Here we see the regular rule illustrated, and the beets derived from the northern are superior in every respect to those from the central and southern belts. It is evident, however, judged by the data obtained during the present year, that Illinois is not so well adapted to the growing of high-grade beets as some of the States to the east of it. Nevertheless, it is quite certain that, with proper drainage, scientific cultivation and fertilization, and good culture, high-grade beets can be grown in many of the northern counties of Illinois, and it would probably be safe to say that for a distance of 100 miles from the boundary between Wisconsin and Illinois the sugar-beet industry could be successfully established where the conditions of soil and factors favorable to manufacture are suitable.

INDIANA.

One hundred and three samples were received at the Department of Agriculture from the State of Indiana, representing several different

parts of the State, but mostly from the northern portions. The largest number of samples, however, from any one county was from Vanderburg, in the extreme southwestern part of the State. The average size of the beets from Indiana was small, the percentage of sugar in the beet fair, and the purity a little below the minimum for good beets. In general, the best beets were grown in the northern portion of the State, near or in the thermal beet belt, although a few samples received from the central and eastern parts of the State were very satisfactory. Among the counties furnishing the largest number of samples may be mentioned Henry, in the central eastern part of the State, from which 8 samples were received, having an average weight of 17 ounces, containing 13.1 per cent of sugar, with a purity of 78.5. The averages for Henry County in sugar and purity were almost exactly those for the whole State. Three samples from Marion County, in the central portion of the State, show excellent results, both in percentage of sugar and in purity, and having an average size of a pound. The best results are reported from Stark County, in the northwestern portion of the State, where the percentage of sugar was 15.7 and purity 81.8. The beets, however, from this region were small, the average size being only 12.8 ounces. The beets received from the agricultural experiment station were very much undergrown, the average weight being less than 7 ounces. The percentage of sugar in the beets was good—15.1—and the purity also above the minimum. The causes of the poor yield of beets are discussed farther on in the report of the chemist of the station. The largest number of beets from any one county was received from Vanderburg, namely, 40 samples. The people of this county have been particularly interested in the industry, and especially to Mr. H. Cordes are we indebted for the large number of samples received. In spite of the very fertile soil and other favorable conditions of culture, the beets had an average size of only 14 ounces, and both the percentage of sugar in the beet and the purity were below the minima. In general, it may be said of Indiana that the northern portions of the State, where the character of the soil is favorable, are best suited to the culture of the sugar beet, namely, those portions either lying in the area of favorable thermal conditions, or extending to a varying distance to the south thereof and covering the greater portion of the northern part of the State. The central counties of the State, judged by the few samples received, may also be expected to grow beets of fair quality. A more careful agricultural survey of the State is needed, and the data above are supplemented by the more valuable data collected by the agricultural experiment station under the supervision of the chemist, Mr. H. A. Huston.

NOTES ON SUGAR BEETS RAISED IN INDIANA IN 1897.

(From Report of H. A. HUSTON.)

The early part of the season was fairly favorable to the growth of the crop. In many cases, however, the beets were planted quite late and were much below normal size when the drought came on in August. From the middle of August until the

end of the usual growing season very little rain fell. This tended to produce beets of high sugar content and small size. The popular interest in the subject has been much greater than in previous years and a much better return than usual was secured from the seed sent out.

At three points in the State parties are now engaged in placing contracts for sufficient acreage to insure a three years' supply of beets for a 300-ton factory. Reports from these localities indicate that the required acreage will be secured.

Nearly all farmers who have raised experimental crops of beets for the past few years report that they believe the crop would be a profitable one at $4 per ton. This estimate is based solely on their own experience with the crop.

The total number of samples analyzed at the agricultural experiment station of Indiana was 205. Arranged by counties, the following table gives the most important data connected with the analyses:

Tests of sugar beets grown in Indiana in 1897 under the direction of the Indiana agricultural experiment station. H. A. Huston and J. M. Barrett.

County.	Average weight.	Average per cent of sugar in juice.	Average purity.	Number of beets by counties.	County.	Average weight.	Average per cent of sugar in juice.	Average purity.	Number of beets by counties.
	Ozs.					*Ozs.*			
Lake	51	8.3	68.0	1	Grant	12	13.6	70.1	2
Porter	12	13.7	84.0	2	Jay	26	13.3	79.5	2
Laporte	22	9.0	64.3	1	Fountain	31	10.1	68.6	1
St. Joseph	24	13.0	85.0	6	Clinton	18	13.2	83.2	4
Elkhart	12	14.8	83.6	7	Boone	13	13.6	82.0	5
Lagrange	12	16.6	87.4	1	Tipton	20	13.5	82.3	11
Starke	14	14.1	85.0	28	Madison	33	9.2	70.2	1
Newton	11	13.7	96.4	1	Randolph	24	12.9	79.0	3
Jasper	2	17.9	84.4	1	Parke	8	10.2	56.7	1
Allen	23	13.5	82.4	21	Marion	17	12.7	83.5	1
Benton	31	11.2	79.6	3	Hancock	23	14.0	87.4	4
White	20	10.3	66.0	1	Henry	19	12.9	78.0	12
Cass	17	12.1	77.2	4	Morgan	14	13.9	82.8	3
Wabash	14	13.0	77.8	4	Greene	12	12.8	84.4	3
Huntington	25	11.8	78.0	19	Jackson	8	10.0	72.8	2
Warren	18	12.2	83.0	1	Vanderburg	15	10.6	77.7	36
Tippecanoe	15	12.5	84.6	8					
Carroll	11	12.4	82.0	5	Averages, etc	17.8	12.6	80.7	205

As will be seen above, nearly all the counties represented are in the northern part of the State. Only a few counties are represented in the central and southern portions of the State. Making an average of the results from the different counties by sections of the State, it is seen that they vary considerably, as is shown in the following summary:

Summary of results.

	Average weight.	Average per cent of sugar in juice.	Average purity coefficient.	Number beets.
	Ounces.			
Northern belt	18.9	13.3	81.9	97
Central belt	18.5	12.9	80.7	67
Southern belt	14.2	10.7	78.0	41

It is seen that there are considerable areas in the northern part of the State where both soil and climatic conditions are extremely favorable to the culture of the sugar beet. The proximity of these counties to Chicago insures a market for all the products of the factory. In many cases these counties are situated in or near the gas area of the State, so that fuel is comparatively cheap. All of them are within easy distance of the great coal fields of Indiana, and the supply of water and limestone is abundant. It is evident, therefore, that all the conditions favorable to the growth and manufacture of the beets exist in the northern part of the State of Indiana, and there is no reason to doubt the speedy foundation and healthy growth of the industry in that locality.

IOWA.

The thermal conditions for the growth of beets in Iowa are favorable over almost the whole of the State from north to south. The southern counties are probably a little too warm for the best results, and the northern counties too much exposed to severe cold weather during harvest time.

One hundred and thirty samples of beets were sent directly from Iowa to the Department of Agriculture for analysis.

In the results as tabulated by counties it will be observed that a great many of the counties are represented by a single sample, and therefore it is not possible to base any conclusions on the work done in respect of the possibilities of growth of beets in such counties. Benton County sent 6 samples, with an average weight of 16 ounces; 13.8 per cent of sugar in the beet, with a purity of 76.9. Clinton County furnished 5 samples. The beets were very small, averaging only 11 ounces. The content of sugar was high, namely, 16.8 per cent, and the purity low, 75.8. Greene County sent 39 samples of good size, namely, 21 ounces; rather low content of sugar, namely, 12.7 per cent, and a low purity, namely, 76.3. Guthrie County sent 6 samples of good size, namely, 23 ounces; rather low content of sugar, 12.5 per cent, with a purity of 78.8. The averages for the 130 samples from the State are as follows: Weight, 18 ounces; sugar in beets, 13.3 per cent; purity, 73.7.

Under the direction of the agricultural experiment station of the State, in cooperation with this Department, a large number of samples of seed was distributed, and 642 samples of beets sent to the station for analysis. Following is an abstract of the report of Prof. C. F. Curtiss, director of the Iowa station:

Total number of samples analyzed, 642.

One and seven-tenths per cent of the samples contained 17 per cent or more of sugar; 73 per cent of these had a purity coefficient of 80 or above, and 50 per cent of these samples weighed 14 ounces or above.

Four and three-tenths per cent of the samples contained 16 per cent and over of sugar and less than 17 per cent; of these samples 86 per

cent had a purity coefficient of 80 degrees or above, and 2.9 per cent weighed 14 ounces or above.

Twenty-two and three-tenths per cent of the samples contained 14 per cent or over of sugar and less than 16 per cent; of these samples 50 per cent had a purity coefficient of 80 or above, and 62 per cent weighed 16 ounces or above.

Forty-one and four-tenths per cent of the samples contained 12 per cent and over of sugar and less than 14 per cent; of these samples 14.7 per cent had a purity coefficient of 80 or above, and 69 per cent weighed 16 ounces or above.

Sixty-nine and three-tenths per cent of the total number of samples contained 12 per cent or more of sugar.

The above percentages are based on the weight of the juice.

The mean weight of the samples received at the Iowa station was 19 ounces, the mean percentage of sugar in the beet 12.4, and the mean purity 76.6. The results by counties are given in the following table:

Analyses of sugar beets grown in Iowa and analyzed by the Iowa agricultural experiment station.

County.	Average weight per root.	Sugar.	Purity coefficient.	County.	Average weight per root.	Sugar.	Purity coefficient.
	Ounces.	*Per cent.*			*Ounces.*	*Per cent.*	
Adair	19	13.40	77.45	Johnson	20	12.54	76.98
Adams	21	13.26	75.30	Jones	17	14.05	77.52
Allamakee	20	14.26	78.87	Keokuk	23	14.06	76.46
Appanoose	8	16.11	82.80	Kossuth	25	12.58	77.26
Audubon	16	13.09	78.36	Linn	17	12.08	74.02
Benton	21	13.30	76.68	Louisa	10	12.65	74.54
Blackhawk	17	13.98	79.64	Lyon	19	14.07	79.33
Boone	17	13.33	76.81	Madison	18	12.55	74.34
Bremer	14	11.24	78.71	Marion	21	12.86	74.66
Buchanan	15	14.24	76.25	Marshall	22	12.51	74.85
Buena Vista	19	13.62	77.70	Mills	19	12.94	76.94
Butler	13	10.77	74.45	Mitchell	20	12.37	76.21
Calhoun	12	15.80	81.46	Monona	27	13.86	80.87
Carroll	22	12.34	75.51	Montgomery	25	12.33	76.52
Cass	22	12.03	75.34	Muscatine	20	14.44	80.92
Cedar	21	12.56	74.48	O'Brien	16	14.38	92.77
Cherokee	19	13.34	77.01	Osceola	14	14.16	81.48
Chickasaw	15	13.34	75.54	Page	23	12.56	74.22
Clay	17	12.08	74.06	Palo Alto	22	12.88	106.85
Clayton	23	13.48	78.47	Plymouth	26	12.49	79.39
Clinton	17	15.81	78.97	Pocahontas	20	11.76	78.46
Crawford	23	10.55	68.24	Polk	22	12.96	76.09
Dallas	23	13.46	79.33	Pottawattamie	19	13.04	78.13
Davis	14	15.78	73.94	Poweshiek	20	12.87	77.52
Decatur	12	14.14	79.27	Ringgold	17	12.54	75.58
Delaware	18	13.23	75.76	Scott	16	13.73	76.59
Dickinson	21	12.81	75.16	Shelby	24	13.43	78.58
Dubuque	17	14.14	69.76	Sioux	28	12.44	73.79
Fayette	17	14.62	80.33	Story	22	12.30	76.51
Floyd	24	12.77	75.01	Tama	17	12.55	77.04
Franklin	17	12.62	73.23	Taylor	11	11.82	70.39
Fremont	19	12.15	71.37	Union	15	13.98	76.54
Greene	19	13.04	77.42	Wapello	19	13.70	76.74
Grundy	23	12.00	73.91	Warren	20	13.62	75.79
Guthrie	22	12.60	74.98	Washington	21	13.84	77.84
Hamilton	21	12.58	75.24	Wayne	13	15.15	70.92
Hancock	18	11.92	75.84	Webster	18	12.57	76.14
Hardin	19	12.88	77.01	Winnebago	22	12.21	76.87
Harrison	17	12.65	76.57	Winneshiek	19	13.57	76.42
Henry	26	14.24	78.64	Woodbury	20	12.72	74.34
Howard	18	13.33	77.48	Worth	18	13.34	78.77
Ida	21	12.79	77.49	Wright	15	12.22	75.48
Jasper	23	13.06	76.86				
Jefferson	12	12.36	76.27	Average	19	12.98	76.56

The results contained in the above table are not as satisfactory as would be expected from the location of Iowa in respect of thermal and other climatic influences. The poor results obtained are due either to the seasonal influences, which might have been particularly bad for the season in question, or to some unsuitability of the soil or climate to the production of high grade beets. In general, it has been observed that soils particularly rich in humus and of a black color do not produce as high-grade beets as sandy and somewhat lighter-colored soils. The character of the subsoil and of the stratum underlying it must also be taken into consideration before we can have an idea of the condition of aeration of the soil and the possibilities of the roots of the beets extending to the proper depth. It is fortunate that the agricultural experiment station of Iowa will continue these experiments in a more careful manner and under more efficient control of the station or some of its representatives. It is evident that with the possible exception of the southern tier of counties a large portion of the State of Iowa with favorable soil conditions should produce beets of high saccharine strength. The causes which have depressed both the content of sugar and the coefficient of purity should be carefully investigated.

Kansas.

Several years ago extensive experiments in growing beets in Kansas were made at Medicine Lodge, and accounts of the work are given in former bulletins on this subject. At that time it was stated, in discussing the results, that the climate of Kansas was particularly unfavorable to beet culture. The extremely dry weather to which much of the State is frequently subjected, in conjunction with the hot winds which sweep over the vast plains almost every year from the southwest, renders the growth of the beet extremely precarious. At times excellent beets can be grown; in fact, beets of fine character were produced at the time mentioned at Medicine Lodge. It is not to be expected, however, that from year to year beets of high grade can be grown in sufficient quantities to warrant the building of factories in the State. Nevertheless, considerable interest is taken in the work by the farmers in various parts of the State, and also by the agricultural college and experiment station. Forty-one samples were received by the Department of Agriculture. The average size of these samples was rather large, namely, 27 ounces. The sugar content was low, 11.4 per cent, and the purity quite low, 73.8. While it is evident that large quantities of sugar can be made from beets of this character, it is also plain, without argument, that such a quality of beets would not be able to compete with those grown in more favorable localities.

The agricultural experiment station of Kansas, in cooperation with the Department of Agriculture, also conducted a series of experiments and received for analysis 157 samples. A detailed report of this work

will be found in the bulletins of the agricultural experiment station of Kansas, and the following summary sufficiently indicates the character of the results obtained. The number of samples analyzed was 157. The average net weight of the beets received was 17 ounces; the average content of sugar in the beets, 11.9 per cent, and the average coefficient of purity of the juice, 77. The percentage of the whole number of beets containing 13 per cent of sucrose or over was 15.2. The percentage of beets containing 13 per cent of sugar or over, having a coefficient of purity of the juice of 80 per cent or over, was 67. The percentage of beets containing 13 per cent and over of sugar and weighing 16 ounces or more, net, was 42.

The analyses made at the agricultural experiment station of Kansas have been consolidated and tabulated by counties. The table of analyses follows:

Summary of analyses of beets from Kansas.

[Compiled from report of experiment station.]

County.	Number beets in samples.	Number samples.	Average weight.	Cane sugar in juice.	Coefficient of purity.	County.	Number beets in samples.	Number samples.	Average weight.	Cane sugar in juice.	Coefficient of purity.
			Ozs.	*Per ct.*					*Ozs.*	*Per ct.*	
Allen	10	1	14	10.64	72.0	Lyon	14	2	16	13.29	79.5
Atchison	17	2	17	12.61	79.5	Marion	33	6	16	11.23	71.8
Barber	14	2	12	14.91	72.5	Marshall	49	5	25	12.20	79.4
Barton	4	1	34	10.35	74.0	McPherson	7	1	7	13.08	76.0
Bourbon	8	1	5	13.88	75.0	Montgomery	21	3	15	11.39	74.6
Brown	10	1	21	11.29	81.0	Morris	14	2	15	14.01	74.5
Butler	22	4	18	10.86	70.8	Nemaha	48	4	23	10.30	74.2
Chase	6	1	14	11.61	77.0	Osage	20	4	16	12.17	77.2
Cheyenne	10	1	17	12.14	79.9	Osborne	10	1	16	12.39	70.0
Clay	37	3	28	11.21	78.0	Ottawa	27	4	22	12.90	78.2
Cloud	93	9	20	11.65	79.2	Pawnee	8	1	4	8.52	70.0
Coffey	4	1	20	15.13	78.0	Phillips	21	2	19	12.16	79.5
Crawford	12	1	14 } 21	13.87	82.0	Pottawatomie	30	3	16	12.20	83.6
Do	3	1	28 }	....	....	Pratt	14	2	8	12.19	75.0
Dickinson	20	4	17	12.29	77.0	Rawlins	8	1	16	9.57	73.0
Doniphan	15	1	24	13.67	84.0	Reno	18	2	12	13.78	79.5
Douglas	11	2	20	12.48	77.5	Republic	49	4	18	10.69	74.5
Edwards	6	1	12	11.12	71.0	Rice	6	2	14	11.71	74.5
Elk	14	2	21	14.04	83.0	Riley	......	3	21	8.98	70.3
Ellsworth	5	1	17	....	....	Rooks	21	2	16	13.39	80.5
Finney	6	1	19	14.14	74.0	Rush	10	1	20	11.88	77.0
Franklin	6	1	16	11.86	77.0	Russell	12	3	10	11.49	71.0
Geary	6	1	13	9.51	70.0	Saline	16	2	9	15.78	84.0
Graham	31	3	18	12.83	76.0	Sedgwick	12	2	12	11.23	74.0
Grant	6	1	16	15.47	78.0	Shawnee	29	3	15	12.19	77.3
Harvey	6	1	5	....	....	Sheridan	20	2	21	11.59	78.5
Do	6	1	14	12.83	78.0	Smith	10	1	28	11.12	78.0
Jackson	14	1	20	11.17	73.0	Sumner	7	1	18	13.38	76.0
Jefferson	6	1	15	11.82	76.0	Waubaunsee	23	2	15	12.14	77.5
Jewell	40	4	19	11.12	77.3	Wallace	6	1	19	11.58	76.0
Johnson	14	2	18	14.23	83.0	Washington	99	10	27	10.79	75.2
Labette	3	1	20	8.76	67.0	Wichita	6	1	14	11.24	79.0
Lane	26	2	4	10.17	68.5	Wilson	36	5	14	13.12	81.0
Leavenworth	22	4	12	12.75	79.0	Woodson	10	1	7	14.32	73.0
Lincoln	16	3	28	11.38	79.6	Wyandotte	4	1	14	14.11	75.0
Logan	10	1	19	11.40	76.0						

The data obtained at the Kansas station corroborate in every respect those secured at the Department of Agriculture. It is evident that

fairly good beets can be grown in Kansas, and there are doubtless seasons when exceptionally rich beets might be secured. In general, however, it may be said that there is no immediate prospect of the successful establishment of the sugar-beet industry in that State, unless it might be in some of the extreme western or northwestern counties, where irrigation might be practiced, and where the altitude is sufficiently high to secure a lowering of the temperature. One of the great causes of danger, however, is found in the hot southwest winds, which frequently blow over the State with disastrous consequences at the period when the crops are growing most rapidly. It will be seen that in many instances individual analyses obtained in Kansas are extremely satisfactory, as for instance, in Elk County, where two samples, including 14 different beets, showed an average weight of 21 ounces, an average content of sugar in the juice of 14 per cent, and an average purity of 83. Another sample is found in Saline County, where 16 beets, forming two samples, showed a sugar content of 15.8 per cent in the juice, with an average purity of 84. In this case, however, the beets were very much under size, the average weight being only 9 ounces. When, however, the data received from the counties are compared with similar data from the State of New York, the discrepancy observed is so great as to indicate, without further elucidation, the proper locality where the first development of the sugar-beet industry should be looked for.

In the light of our previous experiments, it must be evident that high-grade sorghum, developed from carefully selected seeds, has a better prospect in Kansas of being a profitable sugar-producing plant than the sugar beet.

Kentucky.

Only a few samples, with the exception of those sent by the experiment station, have been received from Kentucky. This State being situated far south of the theoretical sugar-beet belt, it is not to be expected that the results of the analyses would be particularly encouraging. The mean weight of the six samples received was 16 ounces, the mean percentage of sugar 11.9, and the purity 71.5. The six samples included four from the experiment station. The beets received were small, and the percentage of sugar only a trifle under the minimum which is advisable for profitable sugar making. The purity, however, is excessively low, and this seems to be characteristic of beets grown too far south, the purity coefficient usually falling in a more rapid proportion than the content of sugar.

Large numbers of samples were received from the experiment station in addition to those analyzed above, which were grown upon the special plot, which will be mentioned later on, and under the most favorable conditions of culture. The beets which were sent to the Department were of good size and mostly of a favorable shape, but the analytical data were very disappointing, falling a great deal lower than

was expected. Nine samples of White Improved Imperial Elite, planted May 8 and harvested December 9, had an average weight of 33 ounces, with 4.9 per cent of sugar. Three samples of original Kleinwanzlebener had an average weight of 23 ounces, with 10.8 per cent of sugar. Sixteen samples of Vilmorin's Improved had an average weight of 25 ounces, with 6.4 per cent of sugar. Thirty-nine samples of the Demesmay variety had an average weight of 29 ounces, with 5.3 per cent of sugar. All of these beets were somewhat overgrown, but not sufficiently so to account for the extremely low percentage of sugar. A large additional number of samples had been selected for analysis, but the results of the preceding analyses were so discouraging as to render the further prosecution of the analytical work unnecessary. This subject will be mentioned again when the experiments in the specially cultivated plots with high grade seeds are discussed.

Maryland.

All the analyses of the samples of beets grown in Maryland were made in the laboratory of this division, the agricultural station at College Park not having undertaken any work of this kind. The whole number of samples received from the State was 29. The mean size of the beets was 19 ounces, the mean percentage of sugar in the beets 11.4, and the mean purity of the juices 79.1. In respect of size, the samples from Maryland are about the mean. The purity of the juice is almost up to the minimum standard, but the percentage of sugar in the beet is about 0.6 less than is advisable for manufacture.

In regard to climatic conditions, as has been before intimated, the State of Maryland occupies a somewhat peculiar position. There is a considerable area along the eastern shore, next to the ocean, where the average summer temperature is 71°. In the western part of the State, after a long deflection to the north, the isotherm of 70° may again be found. Lying immediately south of the isotherm of 71°, in the northern portion of Maryland, are found some very fine valley lands where the conditions of culture may be considered favorable. These lands are underlaid by limestone, which in many cases comes to the surface. Theoretically they are a little too warm for the most successful culture, but lying so near the favorable thermal belt there may be reasonable hopes of successful culture in many localities. In the western portion of the State, where the thermal conditions are favorable, we find the mountain ranges, and the low temperature of the summer is due to the high elevation. The quantity of table lands upon the tops of the mountains, however, is not sufficiently great to warrant the expectation of the founding of a great industry. There is no doubt, however, of the possibility of growing very rich beets on these table lands. In general it may be said that the State of Maryland is not very favorably situated for the culture of sugar beets, but there are circumscribed localities

within the State where it is desirable to conduct further experiments. It is therefore earnestly hoped that the agricultural experiment station of the State will make a more careful agricultural survey of the possibilities of the culture of sugar beets therein.

MICHIGAN.

The southern peninsula of Michigan is favorably situated for the culture of sugar beets, both in respect of thermal conditions and rainfall. The soil is also for the most part well suited to sugar-beet culture. In going northward, however, it becomes more sandy until finally the pine regions are reached, where a soil without fertilization would not be sufficiently rich to produce large crops. The well-known tendency of a sandy soil, with proper meteorological conditions, to produce beets of a high purity is well illustrated in the samples which have been received from Michigan. In all, 450 samples from the State were sent to this laboratory for analysis, 400 of them being from Saginaw County and grown under the supervision of Messrs. Higgins & Lenders.

In regard to the results from particular counties, attention should be called to the fact that the samples from Allegan were all enormously overgrown, the average weight of the beets being 62 ounces and the corresponding content of sugar and the coefficient of purity low. The results from Calhoun County, in the southern part of the State, are particularly favorable, the average weight of the samples being 17 ounces, average content of sugar in the beet 15.8, and the average purity 83.2. The greater part of the samples having come from Saginaw County, the average data for this county are almost the same as those of the State, with the exception that the purity is considerably higher. The average composition of the 400 samples from Saginaw County was as follows: Average weight, 22 ounces; sugar content in the beet, 14.8 per cent, and purity, 83.3. For the whole State—450 samples—the average weight was 22 ounces, average sugar content 14.7 per cent, and average purity 81.1.

The agricultural experiment station of Michigan, in cooperation with the Department of Agriculture, also made an extensive series of investigations, a résumé of which is given below:

RESULTS BY COUNTIES OF THE CULTIVATION OF SUGAR BEETS IN MICHIGAN IN 1897.

The following table is given containing the number of samples sent to the station from each county, the average per cent of sugar in the juice, and coefficient of purity of all samples sent. Seed was distributed in sixty-eight counties, and from the table below it will be seen that samples have been received from sixty-four of them. The average per cent of sugar in the juice of beets of the whole State, when grown on the proper kind of soil and from the right kind of seed, is 16.40, and the coefficient of purity is 84. An average of 16.40 per cent of sugar for the whole State, far exceeding the best districts in France and Germany, is both surprising and gratifying.[1]

[1] These data are obtained by omitting from the table the analyses of samples which were known to have been grown under unfavorable conditions.—H. W. W.

Analyses of sugar beets grown in Michigan and analyzed by the Michigan agricultural experiment station.

County.	Total number of samples.	Sugar in juice.	Coefficient of purity.	Samples rejected for bad soil or seed.	Number of samples on right soil and proper seed.	Sugar in juice in such samples.	Coefficient of purity.
		Per cent.				Per cent.	
Alger	1	14.22	80	0	1	14.22	80
Allegan	3	15.67	86	0	3	15.67	86
Alpena	2	15.01	80	0	2	15.01	80
Antrim	2	15.97	82	0	2	15.97	82
Arenac	8	16.77	85	0	8	16.77	85
Baraga	1	14.10	76	0	1	14.10	76
Barry	4	14.90	81	0	4	14.90	81
Bay	10	15.53	84	1	9	16.00	84
Berrien	3	17.83	87	0	3	17.83	87
Branch	3	16.62	84	0	3	16.62	84
Calhoun	6	15.82	84	0	6	15.82	84
Cass	2	15.44	82	0	2	15.44	82
Charlevoix	7	17.58	87	0	7	17.58	87
Clare	2	16.80	84	0	2	16.80	84
Clinton	4	15.89	84	1	3	16.05	86
Crawford	1	15.25	81	0	1	15.25	81
Eaton	5	17.50	83	0	5	17.50	83
Emmet	1	15.02	82	0	1	15.02	82
Genesee	6	14.75	82	1	5	16.14	84
Grand Traverse	7	15.75	82	2	5	15.91	83
Gratiot	6	16.09	83	0	6	16.09	83
Hillsdale	2	16.71	84	0	2	16.71	84
Huron	6	17.47	85	0	6	17.47	85
Ingham	36	16.43	87	1	35	16.53	87
Ionia	4	16.36	82	0	4	16.36	82
Iosco	6	13.18	77	1	5	14.22	79
Iron	1	18.18	80	0	1	18.18	80
Isabella	4	14.09	78	1	3	16.41	82
Jackson	7	19.74	74	5	2	18.16	86
Kalamazoo	17	15.45	82	3	14	15.87	82
Kalkaska	2	16.91	83	0	2	16.91	83
Kent	16	15.55	83	2	14	15.85	84
Lapeer	2	17.71	84	0	2	17.71	84
Leelanaw	3	18.77	89	0	3	18.77	89
Lenawee	5	15.96	85	0	5	15.96	85
Livingston	2	14.34	80	0	2	14.34	80
Mackinac	1	16.22	85	0	1	16.22	85
Macomb	11	16.11	82	2	9	16.91	83
Manistee	6	17.09	84	0	6	17.09	84
Mason	5	16.54	85	0	5	16.54	85
Mecosta	4	16.67	84	0	4	16.67	84
Menominee	6	16.58	84	0	6	16.58	84
Midland	2	17.62	86	0	2	17.62	86
Missaukee	1	15.79	84	0	1	15.79	84
Monroe	2	16.41	84	0	2	16.41	84
Montcalm	2	17.64	83	0	2	17.64	83
Muskegon	9	16.03	85	0	9	16.03	85
Newaygo	13	16.11	81	1	12	16.54	81
Oakland	7	15.29	83	1	6	16.26	83
Oceana	11	16.54	86	0	11	16.54	86
Ontonagon	4	15.15	79	0	4	15.15	79
Osceola	2	16.55	85	0	2	16.55	85
Otsego	1	18.00	90	0	1	18.00	90
Ottawa	14	16.47	83	0	14	16.47	83
Saginaw	127	15.99	84	4	123	16.13	84
St. Clair	31	17.53	83	1	30	17.64	83
St. Joseph	1	12.16	76	0	1	12.16	76
Sanilac	11	18.15	86	0	11	18.15	86
Shiawassee	4	16.89	83	0	4	16.89	83
Tuscola	1	18.94	89	0	1	18.94	89
Van Buren	4	13.82	80	0	4	13.82	80
Washtenaw	4	16.10	84	0	44	16.10	84
Wayne	9	16.12	84	1	8	17.08	85
Wexford	9	14.59	79	1	8	15.25	81
Total	493				465		
Average		16.08	83			16.40	84

Five samples from Oceana County are not included in results of analyses, because they were dried and damaged by keeping.

Interesting data in regard to cost of culture were obtained at the Michigan station. The plats were planted on the 8th of May, and harvested on the 6th of October. After throwing the dirt away from the beets by a plow they were pulled by hand and the leaves and stems removed. Owing to the deep subsoiling and thorough preparation of the ground, the beets were found wholly embedded in the soil, none of them having been pushed above the surface. The average weight of the beets before the removal of the necks was about 2½ pounds. The following table gives the total labor, calculated to 1 acre, required for growing and harvesting the beets:

	Man and team.	Man.
	Hours.	*Hours.*
Plowing and subsoiling	12.00	....
Harrowing	3.75	....
Marking	.80	....
Planting		3.25
Cultivating	15.00	....
Thinning and hoeing		75.90
Harvesting	4.60	130.75
Total	36.15	209.90

The hand labor in harvesting was performed by boys at 8 cents an hour. The work of hoeing and thinning was performed by men at 12½ cents an hour. The cost of team work is computed at 25 cents an hour for man and team. On the above basis, the total cost of planting, cultivating, and harvesting an acre of beets at the Michigan Experiment Station was $29.40. The yield per acre, the percentage of sugar in the juice, and the purity for each variety grown are shown in the following table:

Variety.	Yield per acre.	Sugar.	Purity.
	Pounds.	*Per cent.*	
Wohanka	23,615	15.22	86
Improved Kleinwanzlebener	25,678	16.40	91
Original Kleinwanzlebener	27,368	18.27	94
Government Kleinwanzlebener	25,648	17.78	94
La Plus Riche	29,205	18.78	92
Government Kleinwanzlebener	32,327	17.78	94
Hoerning's Improved	24,500	15.20	89
Floto's Improved	20,200	13.21	88
Kleinwanzlebener on muck	....	12.96	75

Full details of all the experiments conducted in Michigan by the agricultural experiment station are found in Bulletin No. 150 of that station, issued in December, 1897, by Director C. D. Smith and Chemist R. C. Kedzie.

The study of the two sets of data secured at the Department of Agriculture and by the agricultural experiment station of Michigan is sufficient to demonstrate the fact that the southern peninsula of Michigan has great possibilities for the development of the sugar-beet industry. When it is remembered that the most of those who grew the samples had had no previous experience in the matter, that no systematic fertilization was attempted, and that in many instances the soil was

improperly prepared, the remarkably favorable results obtained are the more convincing. It is evident that all the southern portion of the Southern Michigan Peninsula, in conjunction with the northern part of Indiana, forms an area in which the future will see a remarkable development of the sugar-beet industry.

Minnesota.

Forty-nine samples from the State of Minnesota were received for analysis at the laboratory of the Department of Agriculture. The mean weight of the samples received was 24 ounces, the mean percentage of sugar in the beet 11, and the mean purity coefficient 79.2.

Great variations are shown in the samples received from different parts of the State. One of the best series of results was obtained from Freeborn County, in the southern part of the State, from which twelve samples were received, having an average weight of 20 ounces, an average content of sugar in the beet of 14.1 per cent, and an average coefficient of purity of 82.3.

Another good series of samples, though less in number, was from Ottertail County, in the western part of the State, from which four samples were received, having an average weight of 23 ounces, a mean content of sugar in the beets of 14.9 per cent, and a mean coefficient of purity of 82.1. The general average from the State was lowered by a large number of very poor samples, which evidently had been grown under extremely unfavorable conditions.

The period of growth in Minnesota, while a little short, is nevertheless favorable from other considerations, especially in the southern and eastern portions of the State. Toward the northwestern portion of the State the rainfall is somewhat uncertain, and the autumn is perhaps a little too cold. As has been intimated before, the chief difficulty in Minnesota in the establishment of the beet-sugar industry is not in securing a proper growing season, but in having a sufficient time to properly harvest and protect the beets. The sudden, and often early, advent of winter in the northern and western portions of the State will be the cause of difficulties of a serious nature in the harvesting and siloing of the beets. These are factors which intending investors will do well to carefully consider. In general, the conditions of growth are so favorable as to warrant the careful study of the soils of the State by the agricultural experiment station with a view to selecting those localities where the conditions of culture are most favorable. In a State of such vast area it is far better to determine those restricted sections where the conditions are most favorable rather than try to establish the industry indiscriminately in every portion of the State.

In cooperation with the Department of Agriculture, the agricultural experiment station of Minnesota conducted an extensive series of culture experiments in various parts of the State. The general results of the experiments are indicated in the report of the chemist of the station, which follows.

EXPERIMENTS CONDUCTED BY THE AGRICULTURAL EXPERIMENT STATION OF MINNESOTA.

The seed from which the beets were grown was obtained from a variety of sources. Some procured seed from the stock which the legislature directed the State treasurer to purchase. About 100 pounds of seed were obtained from the United States Department of Agriculture and distributed by the experiment station. Some seed was obtained direct from Germany, while a few obtained seed from seed dealers and other sources. As a rule, the seed was of good quality. Only a few instances of poor seed were reported. There was but little difference as to the quality of the beets produced by the seed furnished by the State and by the Department of Agriculture. At the experiment station the average of four plots of Kleinwanzlebener beets grown from State seed showed 17.5 per cent sugar, with a purity coefficient of 86.7, while the average of four plots of Kleinwanzlebener beets grown from United States Department of Agriculture seed gave 17.4 per cent sugar and a purity coefficient of 87.8.

The past season has not been one particularly favorable to the production of the highest quality of beets. It has been the most unfavorable season in nine years. As a whole, however, the results have been satisfactory, and I consider them of unusual value, because they indicate the quality of the beets which are produced in an unfavorable rather than a favorable season.

At the experiment station the average of those plots which were grown under normal conditions gave a sugar content of 17.4 per cent and a purity coefficient of 87.3.

There is one factor in our favor which I think has been overlooked in considering desirable locations for sugar-beet factories, and that is, we have never lost a sugar-beet crop from hot, dry winds, which occasionally occur in some of the prairie States.

About three hundred samples of beets have been tested during the season. In many cases the results were lower than they would have been if the beets had been properly cultivated. In one of the tables the results are given of some of the beets which have been grown under abnormal conditions. In one case twenty-five minutes' time was spent on a quarter acre of beets, while in another case the seeds were planted five inches. These results, while they possess no value as indicating the quality of sugar beets which may be produced in a locality, are nevertheless valuable, because they emphasize the importance of the right kind of cultivation for sugar-beet production.

Sugar beets grown at the Minnesota Experiment Station.

	No. plot.	No. tests.	Sugar.	Purity coefficient.	Average weight.
			Per cent.	*Per cent.*	*Ounces.*
Highest results: Rows 18 inches apart and beets 4 inches in row			18.5	92.5	12.8
Lowest results: Rows 30 inches apart and beets 10 inches in row			14.2	78.0	18.4
Average of rows:					
24 and 30 inches apart and beets 4 to 6 inches in row	8	16	16.0	86.1	15.1
24 and 30 inches apart and beets 6 to 10 inches in row	8	16	15.8	85.5	14.9
14 and 18 inches apart and beets 8 and 10 inches in row	8	16	15.9	85.4	14.1
14 and 18 inches apart and beets 4 and 6 inches in row	8	16	17.4	87.3	11.6

The cultivation of the beets was under the supervision of the Agricultural Division. The analyses were all made by the chemist of the station.

The analytical data obtained are summarized from the details of the chemist's report in the following table:

Total number of analyses reported	143
Average weight of the beets (ounces)	17
Average per cent of sugar in the juice	13.8
Average coefficient of purity	81.8

The classification of results is made in several portions, namely, analyses of miscellaneous samples from the State at large and analyses of special samples from definite localities. In the analyses of miscellaneous beets collected from different parts of the State, with the exception of those specially mentioned below, thirty four samples were examined. The mean weight of the beet is not given in this table of analyses. The mean percentage of sugar in the juice is 14.25 and the mean purity coefficient 82.

Sixteen samples grown at Mankato, Minn., showed an average weight of 21.9 ounces, a mean percentage of sugar in the juice of 12.8, and a purity coefficient of 80.2.

Ten samples grown at Winton and Stockton had an average weight of 17.1 ounces, contained 13.7 per cent of sugar in the juice, and had a purity coefficient of 81.9.

Eighty-three samples grown at Albert Lea had an average weight of 16.6 ounces, contained 13.8 per cent of sugar in the juice, and had a purity coefficient of 82.1.

In general, it will be observed that the results obtained on the samples sent directly to the station were better than those secured at the laboratory in Washington. Upon the whole, the results of the work done at the experiment station are eminently satisfactory, especially as they were accompanied with the statement of the director that the conditions were the most unfavorable, for the development of a crop of sugar beets, which had been known in the State since the commencement of the experiments in this direction, in 1888.

The results of the analyses of the beets grown at the station are extremely satisfactory. The average weight of the beet, to be sure, is somewhat low, but this doubtless was due to an unfavorable growing season. The mean percentage of sugar in the beets grown in different plots is exceptionally fine, and the coefficient of purity in one instance is higher than could reasonably be expected with the best kind of culture. Only in one of the plots cultivated on the station are the results unsatisfactory, and in this case it is the coefficient of purity especially which has fallen below the standard.

Missouri.

Very extensive experiments were made in Missouri, about 4,000 samples of seed having been distributed, and over 600 returns made. There were sent directly to the Department of Agriculture 324 samples, detailed analyses of which are found in the preceding tables. The average weight of the samples received was 20 ounces. The mean percentage of sugar in the beet was 11.7 and the mean purity 73.5. Many individual samples from the State show excellent qualities, but reliable judgment, as intimated before, can only be based upon large numbers of analyses. Among the counties furnishing beets of high quality may be mentioned Barton, in the southwestern part of the State. Three samples were received from this county, all of them of

rather large size and fine content of sugar, the mean size being 27 ounces, the mean content of sugar in the beet 15.3 per cent; only the purity in all cases was a little low, the mean being 77.3. Benton County, in the center of the State, also showed good results, five samples having an average weight of 16 ounces, an average sugar content of 15.5 per cent, and an average purity of 77.1. The best single sample received was from Pulaski County, in the center of the State, the percentage of sugar being 18.3, the purity 86.1; but the weight was low, namely, only 12 ounces.

Two hundred and ninety-nine samples of beets were sent directly to the agricultural experiment station of Missouri and analyzed in the laboratory of that station. The mean results, by counties, obtained on analysis are given in the following table:

Summary of analyses of beets grown in Missouri.

[From Report of Missouri Experiment Station.]

County.	Number of samples.	Average weight.	Sucrose in juice.	Coefficient of purity.	County.	Number of samples.	Average weight.	Sucrose in juice.	Coefficient of purity.
		Ozs.	Per ct.				Ozs.	Per ct.	
Adair	2	29	14.31	82.89	Livingston	1	12	9.75	70.34
Andrew	1	22	12.16	76.76	McDonald	5	19	13.83	80.05
Audrain	1	32	7.10	56.66	Macon	1	14	14.11	70.89
Barry	4	24	12.85	73.96	Madison	2	20	13.07	71.85
Barton	1	41	16.97	81.62	Maries	1	28	12.95	78.92
Bates	1	22	11.56	76.82	Marion	4	32	9.76	69.32
Benton	2	16	18.19	86.36	Mercer	1	44	13.51	80.22
Boone	2	29	8.19	63.78	Mississippi	3	24	10.57	75.00
Buchanan	4	34	12.20	81.88	Monroe	2	11	7.71	57.57
Butler	1	8	6.47	58.23	Montgomery	5	21	12.62	78.11
Caldwell	6	35	12.99	80.16	New Madrid	2	20	12.30	79.03
Callaway	3	33	12.45	76.45	Nodaway	4	42	11.66	72.61
Carroll	2	28	11.08	75.03	Oregon	1	20	8.37	67.12
Cass	3	22	16.36	84.75	Ozark	1	6	13.81	77.15
Cedar	1	7	11.08	78.86	Perry	1	16	14.06	74.86
Chariton	4	16	12.35	74.24	Pettis	8	24	10.05	65.67
Christian	3	32	11.14	67.86	Phelps	4	13	11.31	75.56
Clark	1	54	12.80	77.76	Platte	4	27	12.11	74.74
Clay	1	36	8.87	67.16	Pike (average)	63	21	10.14	75.55
Cooper	4	19	8.43	61.69	First harvest	38	21	10.94	76.81
Crawford	3	20	11.95	81.27	Second harvest	25	21	9.34	74.30
Dade	2	30	10.56	67.95	Randolph	2	16	14.30	80.17
Dallas	2	16	14.06	74.95	Ray	6	44	10.95	72.40
Dekalb	2	46	10.11	70.40	Saline	3	21	13.74	76.39
Dent	1	10	14.51	72.66	Schuyler	3	25	15.74	82.30
Douglas	2	4	15.19	88.68	Scotland	2	20	15.51	79.46
Franklin	3	30	9.31	70.81	Scott	3	26	9.70	66.43
Gasconade	2	19	10.88	68.60	Shannon	3	12	11.94	76.10
Gentry	7	31	12.68	75.42	Shelby	1	8	7.87	76.26
Greene	1	20	12.27	77.17	St. Charles	5	58	11.21	78.36
Grundy	1	18	12.16	71.11	St. Clair	1	6	21.02	92.19
Harrison	1	6	18.45	....	St. François	2	22	9.68	61.99
Henry	3	25	11.05	66.76	St. Louis	6	27	13.53	82.80
Hickory	1	24	11.88	76.66	Stoddard	1	16	14.79	74.19
Holt	4	29	10.26	73.29	Sullivan	2	26	16.08	85.92
Howell	2	28	13.10	78.18	Taney	3	15	13.08	74.95
Iron	2	13	13.11	79.76	Texas	2	13	14.33	78.47
Jackson	4	36	12.14	79.28	Vernon	7	36	13.17	80.30
Jasper	6	27	11.04	72.57	Warren	2	36	8.07	60.48
Jefferson	3	17	10.71	66.73	Washington	1	28	10.71	73.71
Johnson	5	22	11.90	72.54	Wayne	1	22	13.08	....
Knox	1	46	12.81	74.87	Webster	1	14	13.12	80.58
Laclede	5	19	12.36	68.62	Worth	1	34	11.35	73.13
Lafayette	4	25	11.45	74.08	Wright	4	13	14.01	83.24
Lawrence	1	24	12.12	78.06					
Lewis	2	25	15.60	82.27	Total and				
Lincoln	1	42	7.94	57.18	mean	301	28	11.1	74.9
Linn	5	28	12.28	72.21					

Of the whole number of samples, the percentage of those containing 13 per cent or more of sugar in the beet was 24; the percentage of these beets with a sugar content of 13 per cent or over having a purity coefficient of 80 or over was 83; the percentage of the number of beets containing 13 per cent of sugar which had a purity coefficient of 80 or over and weighing 16 ounces or over was 68.

The average percentage of sugar in the beet for the whole number of samples examined at the station was 11.1. The average coefficient of purity 74.9, and the average weight in ounces 25. A tabular comparison of the mean results obtained by the Missouri station and in the laboratory of the Department will be interesting:

	Total number of samples.	Average weight.	Sugar in juice.	Purity coefficient.
		Ounces.	*Per cent.*	
United States Department of Agriculture	324	20	11.7	73.5
Agricultural experiment station of Missouri	301	28	11.1	74.9

As will be seen above, there is a remarkable agreement between the mean results obtained in the two laboratories. The average size of the samples received at Washington was smaller than that of the beets analyzed at the agricultural experiment station of Missouri, and this is doubtless the cause of the slightly increased mean percentage of sugar obtained in the laboratory of the Department of Agriculture. A general study of the results obtained leads to the inevitable conclusion that Missouri is not very favorably situated for producing beets of the highest quality. It is possible to secure, in some instances, results which are exceptionally favorable, but that such results could be secured continuously, and from season to season, is not probable. The data show that the whole State of Missouri belongs in the same category, in respect of growing rich sugar beets, as the southern parts of the States of Ohio, Indiana, and Illinois. Even the northern counties of Missouri are too far south to give the best results. It is evident, however, in so far as yield is concerned, that Missouri is probably the equal of any State in the Union for growing beets of fine size and large tonnage per acre. Unless exceptional conditions favorable to manufacture are found in the State, it is not probable that the sugar-beet industry will gain a foothold for some time in competition with the more favorable localities farther north and east.

MONTANA.

Only four samples were received from the State of Montana at the laboratory of the Department of Agriculture. The average weight of the samples was 20 ounces, the mean percentage of sugar in the beet 14.4, and the mean purity coefficient of 77.8.

Analyses were also made by the agricultural experiment station of Montana. Fifteen analyses were made of samples grown on the

grounds of the station. The average weight of the samples was 14.8 ounces, the mean percentage of sugar in the beet 16.2, and the mean coefficient of purity of the juice 81.9. Thirty samples grown in the Gallatin Valley had a mean weight of 22 ounces, a mean content of sugar in the beet of 13.7 per cent, and a mean coefficient of purity of 76.4. Eight samples grown at Livingston had an average weight of 24.7 ounces, with a mean sugar content of 13.8 per cent in the beet, and a coefficient of purity of 74.3. Nine samples from Kalispell had a mean weight of 32 ounces, a mean content of 13.5 per cent of sugar in the beet, and a mean coefficient of purity of 76.2. Four samples of beets from Missoula had an average weight of 32 ounces, a mean percentage of sugar in the beet of 12, and a mean coefficient of purity of 73.6. Four samples of miscellaneous origin had an average weight of 23 ounces, an average sugar content in the beet of 12.7 per cent, and a coefficient of purity of 74. The whole number of samples analyzed by the agricultural experiment station of Montana was 70, with a mean weight of 23 ounces, a mean content of sugar in the beet of 14.7 per cent, and a mean coefficient of purity of 77.

The results obtained at the experiment station show what can be done by careful culture, and indicate that Montana, under proper conditions, is capable of producing a fairly good sugar beet. The data in general are sufficiently encouraging to warrant the agricultural experiment station of the State in making a more thorough and careful agricultural survey of the possibilities of beet production.

NEBRASKA.

Thirteen samples grown in Nebraska were received at the Department of Agriculture for analysis. The mean weight of the samples received was 29 ounces, the mean percentage of sugar in the beet 12.9, and the mean purity coefficient 76.9. The studies which have been made in Nebraska have been so thorough in previous years that it would not be advisable to make any deductions from so small a number of samples as was analyzed. In connection with the work done at the Department, the following report of the chemist of the agricultural experiment station of Nebraska may be considered:

RESULTS OF EXPERIMENTS IN NEBRASKA.

We distributed seed to 433 persons. Of these 158 responded, either by sending beets or written communication, or both. Of the 158, 106 returned samples of beets for analysis; 52 reported failure to secure crop. Of the 52 reporting failures, 14 said that the seed failed to germinate; 14 ascribed failure to dry weather; 24 gave various reasons for failure, 13 stating that the crop was destroyed by grasshoppers; 4 lost their crop by reason of stock incursions, and 7 through general neglect.

Putting these figures in the form of percentages: 36.4 per cent of those receiving seed responded in some way; 67 per cent of those who reported to us sent beets for analysis; 26.9 per cent of failures were attributed to dry weather; 26.9 per cent of failures were attributed to poor seed; 25 per cent of failures were caused by grasshoppers; 7.7 per cent of failures were caused by cattle; 13.4 per cent of failures were caused by general neglect.

The results of analyses showed an average of 12.34 per cent of sugar in the juice

with a purity coefficient of 75. The highest per cent of sugar in juice was 16.8 with a purity of 78.5. The lowest was 4.6 per cent with a purity coefficient of 45.

Beet seed was sent into sixty-seven counties and beets were received from thirty-six counties.

The average results obtained agree very closely with those secured in the laboratory of the Department of Agriculture.

So long a time has elapsed since sugar-beet growing was commenced in Nebraska on a large scale that it is possible to form some idea of the adaptability of that State for beet growing. The soils of Nebraska are mostly very fertile, with a fairly level surface, and are well suited in this respect to beet culture. The climatic conditions, as will be seen by consulting the map, are somewhat variable, and the rainfall in parts of the State is scant and in all parts of it very uncertain in respect of distribution. Periods of extremely wet weather are apt to alternate with long droughts. Hot winds may be expected over many parts of the State during the period of most rapid growth, and these winds are extremely injurious to all kinds of vegetation. The winters are apt to come on early and with severity, rendering the harvesting season somewhat precarious. There is no doubt of the fact that good beets can be grown under favorable conditions in Nebraska, but the uncertainties of the season are such as to indicate that there will not be a very rapid expansion of the industry in that State until more favorable areas have been thoroughly exploited. For details in regard to Nebraska the reports of the agricultural experiment station of Nebraska, at Lincoln, may be consulted. For about eight years this station has been engaged in the study of this question, and has published numerous and valuable bulletins, many of which can still be obtained by applying to the director of the station.

NEVADA.

A large portion of the State of Nevada, in fact the whole of the northern and western parts, lies within the thermal area suitable to beet culture. Twenty-one samples of beets were received at the Department of Agriculture from Nevada, the average weight of which was 25 ounces, the average content of sugar in the beet 16.6 per cent, and the average coefficient of purity 81.1. These samples all came from the parts of the State lying within the favorable thermal area. The agricultural experiment station of Nevada, at Reno, also made an investigation of the possibilities of growing beets in that State, and has submitted a report on the subject. In all, twenty-two samples were received at Reno for analysis, the average weight of which was 25 ounces, and the average content of sugar 16.9 per cent, the purity not being given. These data show a remarkable agreement with those obtained by the Department of Agriculture. The beets were grown entirely under irrigation. Some of them, however, received only one irrigation and others as high as five.

The results obtained at the station itself were in the highest degree satisfactory. The total number of samples grown and analyzed at the

station was ten, the mean weight of the beets was 19 ounces, and the mean percentage of sugar 18.9, purity coefficient not given.

Mr. Stubbs, the director of the station, in submitting his report, states that he distributed 90 pounds of the seed received from the Department to thirty farmers residing in fifteen counties. Only five of the thirty farmers sent samples for analysis. One reported failure from stock breaking into the field and destroying the crop; one, failure from lack of water, and one stated that the samples of seeds sent him did not arrive. Mr. John Harrison reports that there are 20,000 acres of land in a single body such as he used for growing his beets.

All the samples sent to the Department of Agricluture by Mr. Harrison, ten in number, were from Humboldt County; the average weight of the samples was 21 ounces, the mean content of sugar in the beets 18.8 per cent, and the mean coefficient of purity 83.1. It is evident that, if such beets as these can be grown in that locality, the 20,000 acres of land suitable to beet culture would suffice to maintain a large factory, which must of necessity prove eminently successful if fuel, limestone, and water can be had in sufficient abundance and sufficiently cheap to operate it. The cultural results in Nevada are of the highest significance. This State, which is devoted chiefly to mining, has very small agricultural interests, but if a few areas capable of irrigation, like that at Lovelocks, in Humboldt County, can be found, Nevada should become a beet producing State. The establishment of this agricultural industry could not fail to be of immense benefit to the Commonwealth. There is no other State in which the reports are more favorable, although it may be said that the number of samples is not sufficiently large to carry absolute conviction. Nevertheless, the uniform excellence of the samples can not be the result of accident, but must have been due to the favorable influences of soil and climate. The agricultural experiment station of this State will do well to make a more careful survey, and especially to map out the localities where the contour of the State is suitable to beet culture and where water can be obtained.

New Jersey.

As has been before stated, New Jersey is traversed from the south toward the north by the mean isotherm of 71° for the three summer months. A portion of it is therefore within the theoretical thermal belt for beet growing. In general, it may be said, however, that the temperature will be found a little too warm to secure the best results. On the other hand, the soil of New Jersey is of a sandy nature, suited to the growth of a beet with a high purity.

The data which have been collected during the season from New Jersey are encouraging. The whole number of samples received from the State was 31, the average weight 16 ounces, the mean content of sugar in the beet 14.2 per cent, and the coefficient of purity 81.4. Essex and Mercer counties each furnished seven samples; the results in Essex County were fairly good, but in Mercer County were poor. Ocean

County furnished eight samples, with a high average percentage of sugar and purity coefficient, but with a weight only half the normal.

No investigations were made by the experiment station of New Jersey, but Mr. James B. Vredenburgh, of Jersey City, conducted some very careful experiments at Freehold, in Monmouth County. The following report of Mr. Vredenburgh is interesting and contains valuable data.

RESULTS OF EXPERIMENTS IN NEW JERSEY.

May 20, 1897.—I had one-quarter acre clover sod plowed and prepared for planting.

May 22.—I had planted four kinds of beet seed, viz, a strip of 111 by 2 feet 9 inches or seven one-thousandths of an acre in imported Vilmorin.

A similar strip in imported Kleinwanzlebener; a similar strip in Government seed, and the balance of the quarter acre in cattle beets.

I fertilized the whole plot equally with 300 pounds of phosphate. I weeded the beets twice, cultivated them five times, and gathered them November 1.

I had one of each kind analyzed each week, commencing August 3, by an expert chemist, the result of which I herewith inclose:

Varieties.	Weight.	
	When gathered.	Without tops.
	Pounds.	*Pounds.*
The Vilmorin	258	239
The Government	279	258
The Kleinwanzlebener	236	220

The Vilmorin, therefore, produced at the rate of 17½ tons to the acre, without tops; the Government, 18 tons to the acre without tops; Kleinwanzlebener, 15 tons to the acre without tops.

It will be seen that by far the best result came from the Vilmorin, the purity of the juice in the analysis of November 1 being 88.20.

This latter result was from an average of three beets, one small, one middle size, and one large.

The cost of the labor, fertilizer, etc., on the one-quarter acre was about $15.

Results on farm at Freehold, Monmouth County.

Date.	Marked.	Weight of the beet.		Percentage of sugar.		Purity coefficient.
		With top on.	With top cut off.	In the beet.	In the juice.	
1897.		*Pounds.*	*Pounds.*			
Aug. 30	No mark	1.171	1.088	10.45	11.30	80.14
30	....do	1.384	1.161	11.15	12.50	83.30
Sept. 8	....do	1.481	1.168	11.75	12.55	79.40
8	....do	1.251	1.000	11.85	....	....
15	Government	2.093	1.545	9.80	10.60	80.60
15	Kleinwanzlebener	1.704	1.329	11.40	12.00	83.90
15	Vilmorin	1.724	1.311	12.40	13.10	84.50
20	No mark (Jack)	0.587	0.505	14.30	15.60	83.40
27	Government	4.391	2.923	10.40	11.25	81.50
27	Kleinwanzlebener	4.491	3.000	10.10	10.35	77.24
27	Vilmorin	4.292	3.058	9.90	10.55	78.47
Oct. 4	Government	2.097	1.700	12.40	13.25	84.30
4	Kleinwanzlebener	1.633	1.225	12.00	13.10	82.40
4	Vilmorin	1.876	1.479	13.80	14.10	86.10
14	Government	1.662	1.474	11.50	12.75	80.20
14	Kleinwanzlebener	2.234	1.770	12.30	12.75	81.70
14	Vilmorin	1.706	1.474	14.20	15.65	84.10
20	Government	1.583	1.373	13.50	14.50	82.00
20	Kleinwanzlebener	2.415	2.037	11.90	12.70	81.90
20	Vilmorin	2.150	1.715	14.30	14.95	83.50
Nov. 1	Government	2.313	1.757	12.40	13.50	78.00
1	Kleinwanzlebener	1.380	1.000	13.10	13.80	83.10
1	Vilmorin	1.270	0.958	14.30	15.35	88.20

Excluding the analyses made before the 20th of September, which would be anterior to the manufacturing season, and including all of those made after that date, we find that the sixteen samples analyzed had an average weight of 27 ounces, a mean content of sugar of 12.5 per cent, and a mean purity of 82.3. These data, obtained by Mr. Vredenburgh, in conjunction with those secured from the analyses of the samples forwarded to Washington, indicate the possibilities of successfully establishing the industry in the State on the lands which are particularly suited thereto. As before stated, however, the danger from a slightly too high temperature must be expected, and while good beets, capable of yielding high percentages of sugar, and with high purities, may be grown in New Jersey, it is scarcely probable that they will reach as high a grade as those grown farther north.

New Mexico.

Only three samples grown in New Mexico were received at this laboratory for analysis. These were all grown in Mora County by the La Cueva Ranch Company. The average size of these samples was small, but the content of sugar and the coefficient of purity of the juice were high. In connection with this work the report of the director of the agricultural experiment station will be found of interest.

RESULTS OF EXPERIMENTS IN NEW MEXICO.

TABLE 1.—*Analyses in the chemical laboratory of the New Mexico Experiment Station prior to October 25, 1897.*

Locality.	Number of samples analyzed.	Average weight of beets.	Average per cent sugar in the juice.
New Mexico Agricultural Experiment Station, Mesilla Park:		*Pounds.*	
Harvested Sept. 15	31	1.21	11.02
Harvested Oct. 14	31	1.53	12.47
Blue Water:			
Harvested Sept. 8	4	1.38	10.50
Harvested Sept. 30	4	1.63	12.70
Albuquerque	3	1.73	13.16
Santa Fe	7	1.06	14.10
Cerro	3	1.04	17.03
Dorsey	1	1.60	12.60
Chapham	1	1.60	15.10
Tularosa	2	1.98	11.20
Anthony	1	1.18	11.50
Maxwell City	3	2.77	14.15
Hatch	1	2.35	11.50
Socorro	1	.48	15.50
Lordsburg	1	.55	16.20
Blossburg	1	3.55	10.80
Aztec Subexperiment Station	1	1.85	14.60
Averages, etc	96	1.61	13.18

TABLE 2.—*Analyses in the chemical laboratory of the New Mexico Experiment Station between October 25 and November 15, 1897.*

Locality.	County.	Number of samples analyzed.	Average weight.	Average per cent sugar in the juice.
			Pounds.	
Aztec Subexperiment Station	San Juan	5	1.5	16.8
Farmington	do	6	1.9	17.6
Jewett	do	1	1.9	13.5
Blue Water	Valencia	4	3.5	10.6
Perea	Bernalillo	2	2.7	12.5
Las Vegas	San Miguel	1	2.8	13.5
East Lasvegas	do	1	3.2	15.1
Pine Spring	Lincoln	1	1.5	13.5
Raton	Colfax	2	2.1	13.1
Maxwell City	do	1	1.7	15.3
Dorsey	do	1	1.1	15.4
Wagonmound	do	1	1.6	13.9
Hatch	Dona Ana	1	1.7	16.5
Santa Fe	Santa Fe	5	1.0	15.9
Hobart	do	1	1.9	14.9
Lacueva	Mora	6	1.1	17.6
Cerro	Taos	1	1.5	18.6
Averages, etc		40	1.7	15.3

TABLE 3.—*Analyses in the chemical laboratory of the New Mexico Experiment Station between November 15 and December 20, 1897.*

Locality.	County.	Number of samples analyzed.	Average weight.	Average per cent sugar in the juice.
New Mexico Agricultural Experiment Station, Mesilla Park.			*Pounds.*	
Harvested Nov. 16	Dona Ana	31	1.7	13.9
Harvested Dec. 15		27	1.6	13.9
Sample came in not marked		1	1.5	17.4
Watrous	Mora	1	.8	12.0
Lacueva	do	2	1.1	15.6
Los Lunas	Valencia	1	2.5	14.5
Blue Water	do	4	1.2	13.8
Roswell	Chavez	3	1.7	13.8
Hagerman	Eddy	3	1.2	13.5
Santa Fe	Santa Fe	3	.8	18.0
Espanola	do	5	1.6	14.1
Jewett	San Juan	1	2.2	13.0
Las Vegas Subexperiment Station	San Miguel	1	1.6	17.6
Averages, etc		83	1.6	14.1

Our work is still in an incomplete condition, as we have not had time to estimate the coefficient of purity and consider some other points in connection with these analyses. I beg to call your attention to the fact that nearly all of the beets analyzed here were grown by farmers who had had no previous experience in growing beets, and whose habits of farming are extremely loose. We can say definitely that if these beets had been grown under such conditions as would be expected to obtain upon a well-regulated farm, the results would have been very much more satisfactory. We know that the conditions under which the most of the samples grew on the station farm here were not of the most satisfactory kind, as we are trying experiments on time of planting, time of harvesting, variety testing, deep and shallow plowing, different modes of irrigation, etc. It is now established beyond a doubt that New Mexico can grow large crops of sugar beets, containing a very high percentage of sugar.

Located at Eddy, in the southeastern part of the Territory, there is already established a sugar-beet factory, doing a successful and profitable business.

In the northern portions of the Territory coal is comparatively cheap, and the

completion of a railroad now in process of building will very materially cheapen coal in the southern part of the Territory.

Limestone seems to be scattered pretty well throughout the Territory, and while we have not had time to go fully into this subject, the few analyses that we have made indicate that the Territory affords limestone of a very good grade. We have just taken a survey of the limestone and waters of the sugar-beet districts. The question of water is engaging our attention, too; and we believe that water of fairly good quality can be secured.

There is a lively interest taken in sugar-beet work in all parts of the Territory, and from the tables herewith inclosed the most favorable locations can easily be selected. Particular attention should be called to the Rio Grande Valley, especially the northern portion, and the Animas Valley. This latter has an extensive and abundant supply of very good water, but at present no railroad. This valley seems to be a very promising section for the production of sugar beets. See Aztec and Farmington in the tables.

The soils of the Territory contain, I think, about the average amount of nitrogen and phosphoric acid and about the usual amount of potash. They have a decided advantage over the soils in the rainfall districts, because the fertility is largely kept up by the plant food contained in the irrigating water, and nearly all that once gets on the soil remains, as very little, indeed, is lost by leaching and drainage.

We expect to publish a bulletin about the 1st of February, giving our results in detail.

The analyses which were made by the chemist of the agricultural experiment station of the samples received by him are classified in accordance with the time at which they were made. Ninety-six analyses made prior to October 25 showed an average weight of the samples of 26 ounces, with an average content of sugar in the beet of 12.5 per cent. The purity coefficient of the juice is not given.

Forty samples analyzed between the 25th of October and the 15th of November had an average weight of 27 ounces, with an average content of sugar in the beet of 14.5 per cent, the purity coefficient not being stated.

Eighty-three samples analyzed between November 15 and December 20 had an average weight of 26 ounces, and an average content of sugar in the beet of 13.4 per cent. The purity was not given.

It is evident that there are many localities in New Mexico where the conditions of temperature are most favorable to the growth of beets. There are also large areas of fairly level land which are capable of irrigation. Wherever the temperature of these regions is sufficiently low to permit the proper development of the beet, and where sufficient water for irrigation can be secured, there is reason to believe that the industry may be established and prove to be fairly profitable. While the summer days in New Mexico are not so long by an hour or more as in the regions farther north, the amount of sunshine which the growing beet will receive is practically as great as in more northern localities, because of the comparative absence of cloudy and rainy days. The remarks which have already been made in regard to the growth of beets on irrigated areas apply to New Mexico. This is a subject which demands the most careful scientific study, and the work which is now doing by the agricultural experiment station of the Territory is certain

to bear excellent fruits in the near future. New Mexico is provided with a beet-sugar factory in the extreme southwestern portion of the Territory, and thus a practical demonstration of the possibilities of beet growing can be made. It is difficult to secure definite data from this factory, but from the meager reports received it is believed that the season's work has not been so successful as had been expected from the results obtained during the preceding year. Accounts have been received of a mold or fungus attacking the beets, and it is also evident that the true principles of irrigation have not yet been thoroughly worked out. There should not, however, be anything discouraging in accidents of this kind, as the conditions, upon the whole, are such as to warrant the expectation of final success.

New York.

On January 16, 1894, in addressing the New York Farmers Club on the subject of beet sugar, I used the following words:

> The plateaus of the great West subject to irrigation are especially suited to the production of sugar beets. The same is true of the lands of certain portions of Nebraska and Dakota, of Iowa, Minnesota, and Wisconsin, of northern Illinois, Indiana, Ohio, and New York. Recently, in passing over the valley of the Genesee River, I was particularly struck with the quality of the soil and its suitability to beet culture. The valley of the Genesee is only a type of hundreds of thousands of acres in New York which could be profitably devoted to beet culture.

At that time practically no experiments had been made to determine the suitability of the soil and climate of New York for producing high-grade beets. In fact, not until the last year has any systematic attempt been made to ascertain the capabilities mentioned above. In the spring of 1896, in conversation with a committee of the board of trustees of the agricultural experiment station at Geneva, I urged upon them the desirability of studying the capabilities of New York for beet production. In 1897 the Department of Agriculture, in cooperation with the experiment stations at Geneva and Ithaca, conducted a series of investigations throughout the State of New York, which has given data of extraordinary interest and importance.

The climatic conditions, as respects temperature and rainfall, affecting the State of New York have already been discussed. It has been seen that there are two areas in which the thermal conditions are particularly favorable, separated by a large area where the mean summer temperature is less than 69°. It has already been pointed out, however, that a lower temperature than 69° is still highly favorable to the production of beets of superior excellence if coupled with conditions which permit their maturity and harvest in time to avoid the severe frosts of winter. These conditions exist in a marked degree throughout the whole of the region in New York lying between the Hudson River on the east and the Great Lakes on the west, excluding the extreme northern portion, where the altitude and mountainous character of the country preclude the possibilities of beet culture. The

whole of the area named, therefore, where the contour is favorable and the character of the soil suitable may be regarded as a prospective area of sugar-beet culture.

SAMPLES RECEIVED AT THE DEPARTMENT OF AGRICULTURE.

From the seed distributed to farmers in different parts of the State, 225 samples of beets were received at the Department of Agriculture for analysis. The mean weight of these samples was 21 ounces, the mean percentage of sugar in the beet 15, and the mean coefficient of purity 82.4. Every county in the State reporting results showed favorable data. The counties having the largest number of samples of course gave data which are the most instructive.

Cattaraugus County supplied 15 samples, with a mean weight of 18 ounces, a mean percentage of sugar in the beet of 15.1, and a mean coefficient of purity of 81.9.

Chautauqua County furnished 45 samples, with a mean weight of 21 ounces, a mean sugar content in the beet of 16.6 per cent, and a mean coefficient of purity of 82.7.

Erie County sent 37 samples, having a mean weight of 19 ounces, a mean content of sugar of 15.9 per cent in the beet, and a mean coefficient of purity of 83.9.

Oneida County was the source of 22 samples, with a mean weight of 14 ounces, a mean sugar content of 13.6 per cent, and a mean coefficient of purity of 81.8.

Ontario County furnished 22 samples, having a mean weight of 17 ounces, a mean content of sugar in the beets of 15 per cent, and a mean coefficient of purity of 83.4.

Yates County supplied 15 samples, having a mean weight of 23 ounces, a mean sugar content of 12.7, and a mean coefficient of purity of 79.6.

The uniformly good properties of so large a percentage of samples collected in the promiscuous way made necessary by the method of the experiments show beyond question the favorable auspices under which they must have been grown.

In addition to the special plot work on high-grade beets which was conducted under the supervision of the Geneva station, cooperative work by the Department of Agriculture, in conjunction with the farmers of the State, was also carried on. From the whole number of packages of seed distributed by the station, 135 samples of beets were received for analysis, and the results obtained, without distinction of locality, are shown in the following report of Director Jordan:

RESULTS OF EXPERIMENTS IN NEW YORK.

The number of samples reported is 135, which came from a sufficient number of points in the State to make them fairly representative of the conditions prevailing.

I make no report to you of the production, because in most instances, whenever the tonnage was reported, the figures appeared to us to be unreliable because of the methods used in reaching them.

Kleinwanzlebener.

Beets containing sugar.	Number of samples.	Average per cent sugar in beet.	Coefficient of purity.	Average weight of one beet.
Per cent.				*Ounces.*
11–12	4	12	76.5	20
12–13	11	13	75.4	18
13–14	10	13.8	80	14
14–15	11	14.7	80.3	17
15–16	15	15.8	84.3	14
16–17	11	16.5	85.3	16
17–18	13	17.6	85.2	14
18–19	3	18.5	85.9	13

Vilmorin Improved.

Number of samples.	Average per cent sugar in beet.	Coefficient of purity.	Average weight of one beet.
			Ounces.
3	11.7	75	16
5	12.8	76.7	24
9	13.8	82.4	19
8	14.8	83	16
17	15.6	82	16
9	16.6	87.5	15
6	17.8	85.4	18
2	18.6	83.8	24

My chief anxiety with regard to the development of the sugar-beet industry in New York is that farmers shall not reach unwarranted conclusions concerning the profits of their side of the work. I have no reason to believe that the industry will prove more profitable to our farmers than the production of several crops which we are now growing. I recognize, of course, the benefits of adding to our list of crops another one which will have a ready cash market.

There appears to be a move all over the State for the establishment of factories at desirable centers, and promoters are already in the field who are, as a rule, urging the farmer to invest in beet sugar-factory stock. I am very much afraid that there will be serious misdirection of capital, which will not only cause the farmer to lose money, but seriously disappoint him in regard to the benefits from growing sugar beets. My judgment is that the matter should be discussed by those who take the lead in the matter in the most conservative way, and both farmers and business men should be severely cautioned to proceed slowly and only after extended and careful investigation.

A carefully grown crop of sugar beets yielded on the experiment station farm this season at the rate of 16¼ tons per acre, carrying 15.2 per cent sugar in the beet and 16 per cent in the juice. No dependence should, in my judgment, be placed upon the reports of yields of 25 and 30 tons per acre of high-grade beets in this State.

In studying the report of Director Jordan we see that of the Kleinwanzlebener variety only four samples out of the whole number fell below the minimum of 12 per cent of sugar in the beets, and of the Vilmorin variety only three. This is without doubt a remarkable showing of excellence, in so far as the content of sugar is concerned. The caution of Director Jordan to proceed carefully in this matter, and with a due study of the factors, is perfectly in harmony with the tenor of the reports which have been issued by the Department of Agricul-

ture, on the subject of beet sugar, from time to time during the past fifteen years, and is deserving of careful consideration, both by intending investors and farmers. Our reports have constantly dwelt upon the danger of misdirected enthusiasm and failure to study properly all the factors entering into any enterprise connected with the manufacture of sugar.

The agricultural experiment station of Cornell University, at Ithaca, also cooperated with the Department in the experimental work in New York. Four hundred and twenty-five samples were received for analysis at the experiment station at Ithaca. The data obtained on analysis, arranged by counties, are given in the report of Director Roberts. In this report the percentage of sugar in the juice of the beet only is given, the mean being 16.9. Converting this number into terms of the sugar in the beet, the percentage becomes 16.1, which is one point higher than the mean percentage of sugar in the samples from New York analyzed by the Department of Agriculture. The coefficient of purity, 83.5, obtained at the Ithaca station is only a little over one point higher than that secured from the analyses by the Department of Agriculture.

Director Roberts, in his report, estimates that the mean yield per acre obtained in the State of New York was 17 tons, but as his estimate is made upon the returns made by the farmers, many of which are evidently too high, it is not final as a source of deductions in regard to the average yield which may be obtained. It is not at all likely that an average yield of 16 tons per acre could be obtained, even by the best culture.

The counties furnishing the data with the most weight are Broome, Chautauqua, Erie, Genesee, Monroe, Steuben, and Wayne. Chautauqua County, especially, is to be regarded on account of the mean data being based upon 122 separate samples, in which the mean percentage of sugar in the juice was 16.8, and the mean coefficient of purity, 83.5. The next highest number is furnished by Genesee County, where the mean percentage of sugar in the juice from 62 samples is 16.6, and the coefficient of purity, 82.9. Monroe, with 59 samples, showed a mean sugar content in the juice of 17.2 per cent, and a mean coefficient of purity of 83.9. Erie County, with 38 samples, gave a mean content of sugar in the juice of 17.9 per cent, and a mean coefficient of purity of 86.3. Wayne County furnished 27 samples, having a mean content of sugar in the juice of 16.7 per cent, and a mean coefficient of purity of 82.9. Broome County sent 25 samples, containing 16.2 per cent of sugar in the juice, with a coefficient of purity of 81.8; and Steuben County furnished 24 samples, containing 16.2 per cent of sugar in the juice, with a coefficient of purity of 82.6. Following is the report of Prof. Roberts:

The 500 pounds of sugar-beet seed sent us by the Department of Agriculture were distributed to over 300 farmers of the State, with directions as to preparation of the soil, planting, and cultivating. During the growing season, the larger part of

the plats was inspected by an officer of this station and observations made as to the general conditions found.

The season was a favorable one, and in nearly all cases the beets made good growth, and that the per cent of sugar was satisfactory will be shown by the table of analyses given later.

It is safe to say that the citizens of New York State, both capitalists and farmers, are thoroughly awakened to the importance of the subject of the manufacture of sugar from beets. During the season one factory has been in successful operation at Rome, N. Y. Other factories are contemplated, and at the present time agents are in France negotiating for machinery to be used in a large factory to be erected the coming season.

Officers of this station attended eight meetings of farmers and capitalists to give information and advice as to the advisability of locating factories in certain sections of the State. Abundance of capital is ready to be invested once the success of the industry is assured. Farmers feel that in the raising of sugar beets a new avenue is open for them, and in most parts of the State favorable for the growth of beets they are heartily favoring the new enterprise.

When the various experimental plats were harvested, agents from this station personally superintended the taking of the samples and the calculations of yield on 178 of the plats. To those farmers whose places we were unable to visit directions were sent as to how the samples should be taken and the yield estimated; so it is believed that this report of results is a fair statement of what can be done in New York State in the way of raising sugar beets.

The necessity now seems to be the education of the farmers in the system of intensive culture necessary for the successful raising of the beets. The farmers appreciate the importance of this instruction, and are eager to learn. It is safe to predict that the manufacture of sugar from beets is to be one of New York's prominent industries in the near future.

The following report is furnished by our chemists, summarizing the results by counties:

Report of sugar-beet experiments in New York, 1897.

County.	Sugar in juice.	Purity coefficient of juice.	Total number of samples analyzed.	County.	Sugar in juice.	Purity coefficient of juice.	Total number of samples analyzed.
	Per cent.				*Per cent.*		
Albany	17.25	86.6	1	Oneida	16.16	82.1	4
Broome	16.23	81.8	25	Onondaga	17.40	86.6	1
Cattaraugus	16.94	84.5	15	Orleans	17.20	86.1	3
Cayuga	17.34	84.3	10	Oswego	14.45	76.1	1
Chautauqua	16.83	83.5	122	Saratoga	20.25	86.6	1
Erie	17.93	86.3	38	Schuyler	16.26	79.7	2
Genesee	16.62	82.9	62	Seneca	16.58	83.2	5
Herkimer	13.85	79.2	1	Steuben	16.24	82.6	24
Jefferson	16.16	81.0	3	Tioga	18.73	82.7	2
Livingston	19.25	85.6	1	Tompkins	17.49	83.1	8
Monroe	17.22	83.9	59	Wayne	16.74	82.9	27
Montgomery	15.08	79.3	3				
Niagara	17.31	83.4	7	Average	16.89	83.5	425

From the foregoing data, the conclusion is inevitable that the State of New York stands among the first in the Union in its capabilities of producing beets with a high content of sugar and a high purity. The meager data at hand also show that a fair tonnage per acre can be secured. It is evident that with proper fertilization and rotation of crops the fertility of the soil can not only be maintained, but even increased, so that it is not unreasonable to expect, under the best con-

ditions of culture, that the mean tonnage per acre produced in the State of New York will be quite equal to that of the best sugar regions of Germany. Judging by the data obtained from a single season alone, there is no sugar-beet producing country of Europe that can compete with the State of New York in the richness of its beets. If a factory, constructed on the best approved modern principles, and with every facility for converting the whole of the sugar into marketable form, could be supplied with such beets as were grown in the State of New York during the season of 1897, it would be capable of placing upon the market 240 pounds of pure granulated sugar for every ton of 2,000 pounds of beets entering into manufacture. When, in addition to these facts, are considered the cheapness of fuel, the abundance of labor, the proximity of markets, and the importance of the dairy industry in its relations to the refuse of the factory as a feed, it is seen that there is no place in the United States which offers more favorable inducements for the development of the industry.

ELEVATION OF REGIONS OF NEW YORK SUITED TO BEET CULTURE.

A contour map of the State of New York, showing the elevations above tide water, is found in the fifth annual report of the meteorological bureau and weather service of the State for 1893. The elevation in the region of the Catskills in some places reaches an altitude of 3,000 feet. Immediately west of this mountainous region, and extending to Binghamton on the south and almost across the State through the south central portion, there is a large area in which the average elevation is 1,000 feet. In the southwestern portion of the State there is a considerable area the elevation of which is 1,500 feet. The region of the Adirondacks and the northeastern portion of the State has various elevations, but as these regions are probably too far north for successful beet culture they do not interest us here. Starting from Albany with an average elevation of 100 feet and following the course of the New York Central Railway, we pass through an area a large portion of which is below 500 feet in elevation. From Rome through Syracuse and as far west as Lyons the average elevation is less than 500 feet, with the exception of small areas. From Lyons to Buffalo the average elevation is above 500 and less than 1,000 feet. Immediately along the shores of Lake Ontario the average elevation is less than 500 feet. Passing to the south near Rochester, along the Genesee Valley, is a considerable area below 500 feet in elevation.

An interesting description of the physical contour of the State is given in the report mentioned above as taken from the work of Prof. Arnold Guyot. This description is as follows:

The following outline of the orography of New York is substantially as given by Prof. Arnold Guyot. Further details are exhibited by the accompanying relief map.

The mass of the State is a triangular table-land elevated 1,500 or 2,000 feet above the ocean, and may be considered the northeastern extremity of the plateau which, in this latitude, forms the western half of the Appalachian system. The natural limit of this belt toward the west and north is the large depression of Lakes Erie and Ontario, and which continues down the course of the St. Lawrence River to the ocean. In the east the table-land is terminated by the deep valley occupied by Lake Champlain and the Hudson River, while southward the highlands extend without interruption into Pennsylvania. The eastern edge along the Hudson and Champlain valleys is formed by a series of mountain chains more or less isolated from each other, and bearing the highest summits in the State. They are: The Highlands, which cross the Hudson at the limit of the coast region; the Shawangunk and Catskill mountains, on the western bank of the river, and the system of the Adirondacks, covering the territory between the St. Lawrence and Champlain valleys. Within this eastern wall the true mountain chains cease, but the remainder of the plateau is indented by numerous valleys, the bottoms of which are generally several hundred feet below the common level, and which are separated by high ridges. A remarkable feature is the deep transversal cut which forms the valley of the Mohawk and Lake Oneida, opening a channel from the low country of the Lake region to the Hudson valley, and thus dividing the main plateau into the distinct masses of the Appalachian and Adirondack systems.

A subdivision of the central or Appalachian highlands is due to the deep channel of Seneca Lake, extending from the plains bordering Lake Ontario southward to the valley of the Susquehanna. The two sections of the highlands thus separated are here designated as the eastern and western plateaus, the former extending from the central lakes to the Hudson Valley, and the latter westward from the central lakes to the depression of Lake Erie.

NORTH DAKOTA.

Only four samples were received from North Dakota, the average weight of which was 28 ounces, and the mean percentage of sugar in the beet 10.5. On account of the low content of sugar, purity coefficients were not computed.

No report has been received from the director of the North Dakota station in regard to any work which has been carried on by that station. The data of the four samples received are likely to be misleading, as it is evident that North Dakota is capable of producing very much better beets than are indicated by the data in the analytical tables.

NORTH CAROLINA.

By consulting the map it may be seen that there are many localities in North Carolina where the thermal conditions are favorable for the growth of high grade beets. It is doubtful, however, whether upon the summits of the Allegheny Mountains, where these conditions exist, a sufficient area of suitable soil could be secured to warrant the expectation of establishing successfully a beet-sugar industry in that State.

Only seven samples were received from North Carolina by the Department of Agriculture. The mean weight of these samples was 23 ounces, and the mean percentage of sugar in the beet 9.1. On account of the

low polarization of the samples, it was not deemed necessary to make a computation of the coefficient of purity.

No analyses were made at the laboratory of the experiment station of North Carolina during the year, although the director of the station has been much interested in the work, and proposes to continue it another season.

OHIO.

Sixty-eight samples of beets grown in Ohio were received at the Department laboratory for analysis. The mean weight of these beets was 22 ounces, the mean content of sugar 13.8 per cent, and the mean coefficient of purity, 79.1. Grouped by belts into northern, central, and southern, the character of the beets grown in Ohio and analyzed at the Department of Agriculture is shown in the following table:

Summary of analyses of beets from Ohio, by belts.

Belts.	Number of samples.	Average weight.	Sugar in beets.	Purity coefficient.
		Ounces.	*Per cent.*	
Northern belt	42	21	14.1	79.9
Central belt	19	23	13.6	78.5
Southern belt	7	26	12.7	75.7

It will be seen from the above that the northern belt of the State produced the best beets, both in content of sugar and purity, and in this respect the data obtained by the Department corroborate in every particular those secured by the Ohio Experiment Station mentioned below. It is evident, from a consideration of the two sets of data, that the northern portion of Ohio offers favorable inducements, both for the culture of the beet from an agricultural point of view and by reason of cheapness of fuel and the facilities of transportation from the manufacturing point of view. It is evident, however, that the central and southern parts of the State, as is the case with Indiana and Illinois, should not be exploited with the purpose of investing money in the beet-sugar industry until the available localities in the northern regions are entirely occupied.

With the cooperation of the Department of Agriculture, the agricultural experiment station of Ohio distributed a large quantity of seed to farmers in that State, and from the seed so distributed 607 samples of beets were forwarded to the station and analyzed. The results of the analyses by counties are given in the following table:

EXPERIMENTS CONDUCTED BY THE OHIO AGRICULTURAL EXPERIMENT STATION.

Summary of results of sugar-beet investigation for Ohio, 1897.

County.	Number of samples analyzed.	Average weight of beets.	Sucrose in juice.	Purity coefficient.	County.	Number of samples analyzed.	Average weight of beets.	Sucrose in juice.	Purity coefficient.
		Grams.	*Per ct.*				*Grams.*	*Per ct.*	
Ashland	4	831	12.7	76.0	Marion	7	555	12.4	77.5
Ashtabula	2	679	14.9	82.8	Medina	6	947	13.9	76.2
Auglaize	9	1,128	14.4	77.0	Mercer	11	1,119	13.2	77.2
Belmont	1	660	16.6	86.9	Miami	12	773	12.6	75.9
Champaign	1	825	13.2	77.6	Montgomery	3	755	11.8	73.5
Clark	11	610	14.1	78.7	Muskingum	5	566	14.4	78.2
Columbiana	1	610	18.4	83.6	Ottawa	13	694	15.7	78.8
Coshocton	4	860	12.9	72.9	Paulding	9	802	15.6	80.0
Crawford	7	1,095	13.8	77.1	Perry	1	127	19.1	80.9
Cuyahoga	4	894	12.9	75.5	Pickaway	1	710	16.5	81.6
Darke	44	864	13.3	76.9	Pike	1	595	14.0	77.8
Defiance	23	851	13.7	77.9	Portage	2	1,554	9.3	*a*69.7
Delaware	4	559	14.9	79.3	Putnam	19	958	13.1	76.5
Erie	1	1,406	15.0	80.6	Richland	2	496	16.6	83.4
Fairfield	5	599	12.8	74.9	Ross	31	697	13.5	76.6
Fayette	2	620	14.6	78.9	Sandusky	3	812	14.8	79.6
Franklin	5	524	15.3	80.0	Seneca	10	762	14.8	77.5
Fulton	24	1,065	14.1	79.2	Shelby	8	607	14.0	80.0
Geauga	6	694	16.3	84.8	Stark	8	712	15.3	80.8
Greene	11	1,285	9.9	66.8	Summit	28	684	14.7	80.2
Hardin	4	796	12.1	74.2	Tuscarawas	4	865	14.8	79.1
Henry	33	810	15.3	80.9	Union	2	1,077	15.9	80.6
Highland	1	840	13.2	68.4	Van Wert	21	1,064	12.5	73.1
Hocking	1	1,521	7.2	*a*59.0	Wayne	97	787	13.9	80.7
Holmes	6	680	13.6	81.0	Williams	3	979	16.2	80.2
Huron	1	303	16.0	76.1	Wood	26	777	14.4	78.3
Knox	4	642	15.9	81.9	Wyandot	1	605	15.1	79.8
Lake	5	789	14.9	82.7					
Licking	11	562	11.9	74.9	Southern section	69	892	12.8	75.3
Logan	2	779	12.8	80.0	Middle section	146	924	13.9	78.0
Lorain	1	520	16.0	81.2	Northern section	392	834	14.3	79.4
Lucas	32	889	14.3	78.5					
Madison	5	711	14.3	76.8	Entire State	*b*607	867	14.0	78.7

a Not included in average of State.
b Some samples were received without name and address of grower.

It will be observed from the above table that the number of samples analyzed was 607. Only 554, however, of these samples figure in the averages for the State, the others having been rejected for computing purposes by reason of certain abnormalties which they presented. The Ohio results are exceedingly encouraging from every point of view, with the exception of purity alone. The average weight of the beets was 867 grams, equivalent to 30.6 ounces. The average per cent of sugar in the expressed juices was 14 per cent, equivalent to 13.3 per cent in the beet, and the average coefficient of purity of the juices was 78.7. The most interesting grouping of the samples is shown at the end of the table, particularly so because in the State of Ohio the most favorable theoretical thermal conditions prevail only in the northern counties. The grouping of the total number of samples into three portions, representing the northern, central, and southern sections of the State, shows in a convincing manner the effect of thermal conditions on the sugar content of the beet. The northern counties furnished 392 samples, with an average weight of 834 grams, equivalent to 29.4 ounces, with

an average percentage of 14.3 per cent of sugar in the juice, equivalent to 13.6 per cent in the beet, with an average coefficient of purity of 79.4. The middle section furnished 146 samples, with an average weight of 924 grams, equivalent to 32.6 ounces, with a mean content of sugar of 13.9 per cent in the juice, or 13.2 per cent in the beet, and a mean coefficient of purity of 78. The southern section furnished 69 samples, with an average weight of 892 grams, equivalent to 35 ounces, a mean percentage of 12.8 per cent of sugar in the juice, or 12.2 per cent in the beet, and a mean coefficient of purity of 75.3.

It is seen by the above that there is marked improvement, both in the percentage of sugar and the purity of the juice, in the beets in Ohio as we advance from its southern to its northern border.

The results of the work of the experiment station of Ohio have already been published as Bulletin No. 90 of that station, and interesting details connected with the above data can be found therein. The bulletin also contains interesting maps, showing isothermal lines and conditions of precipitation in the State. The remarks of the authors of the bulletin, namely, Mr. A. D. Selby and Mr. L. M. Bloomfield, on the general character of the results are interesting and are found below:

Taken as a whole, these analyses seem to indicate that beets of good quality may be grown in most counties of the middle and northern sections of Ohio, and, further, that many portions of the southern section may be adapted to sugar-beet growing, although on the whole less promising than more northerly districts. The analyses from Fayette, Pickaway, Ross, Pike, and Perry counties appear encouraging. The sugar content in Ross County is decidedly reassuring, though the purity is slightly below the standard. Judging by the samples, this might have been greatly improved by more careful culture and better selection of typical specimens. The unfavorable results in Greene and Montgomery counties are not taken to indicate what may really be done in these counties. For the southern section, and particularly the valley districts, further trials should be made. Close planting should be practiced on rich lands.

For the middle section, as a whole, good sugar beets may apparently be grown when growers have learned what to avoid in planting and culture. The low averages in samples from Mercer, Hardin, and Coshocton counties may not certainly be taken as conclusive evidence of conditions unfavorable to sugar-beet culture. Those reported from sandy soils in Mercer County show a fair purity. The results from Belmont, Muskingum, and Tuscarawas counties point to better things in the eastern counties than previously anticipated. More trials in this region another year are certainly warranted by these analyses.

As anticipated from previous trials, it is the northern section which makes the most favorable showing as a whole. Samples were received from every county of the northern section except Trumbull, Mahoning, Hancock, and Allen. A sample was received from Columbiana County after the tables had been completed. While the lake shore district shows to good advantage here, the counties situated along the summer isothermal of 70° F. are but slightly, if at all, inferior, though represented by a much larger number of samples. Ottawa County gives a low purity with a high sugar content, 15.7 per cent. It will be noted that a large number of samples is not conducive to extremely high averages in the tables.

In fact, practically all the counties of the State show a rather high sugar content, 14 per cent in juice when all are averaged, and it is to the coefficient of apparent purity that we must direct our attention to discover differences. Under all the circumstances an average purity of 78 and above may be taken as fairly satisfactory for the present year's analyses.

It is to be borne in mind, when these results are considered, that the percentages were obtained for the most part in comparatively fresh samples, from which only the leaves had been removed. Topping the beets, as for factory use, was not encouraged, owing to the risk of water loss by evaporation. This has led, possibly, to lower percentages than where beets were topped and sent considerable distances by mail. While the actual sugar content would be but slightly, if at all, reduced by loss of water, the apparent sucrose per cent would be changed.

OKLAHOMA.

Only one sample of beets was received at the laboratory of the Department of Agriculture from Oklahoma. The average weight of the beets composing the sample was 10 ounces, the mean percentage of sugar in the beets 11.8, and the coefficient of purity, 72.5. The director of the agricultural experiment station has submitted the following report of the analyses of 21 samples, showing a mean percentage of sugar in the juice of 12, and in the beet of 11.4, and a mean coefficient of purity of 65.3. The mean coefficient of purity as obtained at the experiment station of Oklahoma is phenomenally low. These data, taken in connection with the climatic conditions which prevail in that Territory, are sufficient to indicate that there is no prospect of establishing a beet-sugar industry in Oklahoma.

RESULTS OF EXPERIMENTS IN OKLAHOMA.

Seed and culture directions were sent to farmers in each county, and the number of requests for seed quickly exhausted the available supply. But twenty-four reports were received and twenty-one authentic samples examined. Of the three total failures reported, one is stated as due to flood, another to drought, and the third to hail. The yield, judging from the vague and indefinite reports which I have been able to secure, varied greatly. It seems that in many cases the seed was sown too far apart in the drills and that but little regard was paid the culture-directions sent out. In general, a poor stand was secured, and the majority of those reporting are not enthusiastic as to the prospects of the sugar-beet industry in Oklahoma.

I inclose a tabular statement of the results of analyses of beets. The low coefficient of purity of the juice is especially noticeable.

Analyses of sugar beets grown in Oklahoma Territory, 1897.

County.	Sugar in juice.	Coefficient of purity.	County.	Sugar in juice.	Coefficient of purity.
	Per cent.			Per cent.	
Canadian	9.3	53.1	Logan	9.3	58.1
Do	13.0	66.3	Oklahoma	14.0	78.6
Do	10.1	62.7	Pawnee	12.2	68.5
Cleveland	13.0	74.3	Payne	17.7	72.5
Custer	13.9	68.1	Do	11.9	54.3
Garfield	12.6	67.3	Do	11.8	64.3
Kingfisher	14.9	66.2	Do	11.8	63.1
Lincoln	10.8	73.0	Do	8.4	52.1
Do	10.8	57.7	Pottawatomie	12.8	61.2
Do	13.9	81.8			
Do	10.1	60.1	Average	12.0	65.3
Logan	9.6	68.6			

OREGON.

No samples of beets were received at the Department from the State of Oregon during the season. Previous analyses of beets received from that State have shown uniformly a high content of sugar and a

high coefficient of purity. The agricultural experiment station of Oregon for several years has devoted a great deal of time and attention to the study of the sugar-beet industry in that State and published valuable reports on the subject. Mr. G. W. Shaw has prepared a résumé of the work of the station and of the Department, which contains the summaries of the work done, with various comments on the data obtained. This report is given below.

RESULTS OF EXPERIMENTS IN OREGON.

In his notes on the analyses of beets for the season of 1891, Dr. H. W. Wiley, chemist of the United States Department of Agriculture, said: "The samples from Oregon are uniformly rich in quality, and if they truly represent the capabilities of the State there is certainly a bright future for the sugar-beet industry on that portion of the Pacific coast." This was said relative to a series of 33 analyses made at the United States Department of Agriculture, which gave the following average results: weight, 644 grams; sugar in the juice, 14.5 per cent; purity, 82.2.

It was to obtain a decided answer to the question, "Does Oregon possess the requisite conditions for the manufacture of sugar from beets?" that the writer, as chemist of the Oregon Experiment Station, began a series of experiments with beets in 1891, which were continued in 1892 and again in 1897. The results of these investigations are here briefly set forth, more detailed account of which may be had by applying to the station for Bulletin No. 44.

The sugar beet does not differ from other plants in requiring certain conditions of climate and soil to give favorable results. In foreign countries both of these questions have been pretty satisfactorily settled, but in some parts of the United States the plant seems to thrive under very different conditions than obtain in foreign countries. Notably is this true concerning the rainfall, as is illustrated in the case of California and Utah, as well as in the experimental culture in Oregon, as will appear later; hence foreign countries can not be taken as representing the only conditions under which the root will thrive. However, it does there thrive and these conditions can by no means be ignored. It also thrives, and that splendidly, in our own California, hence her conditions can not be disregarded in a consideration of this question. Let us examine Oregon's condition of climate and soil that, if possible, we may obtain some a priori ideas on these lines.

The season for the growth of beets may be divided into three periods—that of germinating, that of plant formation, and that of sugar storing. The following is a comparative table showing the temperature averages for Germany and certain parts of Oregon during these periods:

Average temperature for periods of growth.

Period of growth.	Average temperature.			
	Foreign.	Eastern Oregon.	Willamette valley.	Southern Oregon.
First	49.1	56.0	52.5	53.3
Second	63.3	65.0	64.4	64.5
Third	56.3	64.5	63.3	54.8

Taking as a basis Dr. McMurtrie's mean isotherm for sugar-beet culture at 70° for June, July, and August, Dr. Wiley, in his report upon beet culture, gives a map of the United States, showing 100 miles on each side of this isotherm, within which area favorable results may be looked for.

It is in the rainfall of the State that we find the greatest seeming deviation from those portions of the world which are taken as typical beet-producing regions. This seeming difference should not be considered as a too serious drawback, nor would it appear so to those acquainted with all the conditions. The average amount of rainfall does not differ much from that of the beet-growing regions of other countries, yet it is not so evenly distributed. It must be borne in mind, however, that the soils of Oregon are much different with respect to their retentiveness of moisture, and that for all our crops the necessary moisture nearly all falls during the "wet season," and for this reason we do not usually consider the monthly rainfall as bearing so close relation to the crops as it does in most other States, but rather are wont to consider the seasonal precipitation as the more important factor. In this respect ours is similar to the condition which obtains in our sister State, California, in which the beet industry has reached a high state of development.

Champion and Pellet consider phosphoric acid as an indispensable base for the formation of sugar in the beet. They classify the order in which the plant food is indispensable as follows: (1) Phosphoric acid, (2) lime, (3) nitrogen, (4) potash.

It is foreign to our purpose to discuss, at this time, the soils of Oregon to any length, but in connection with the last statement I desire to direct attention to the fact that the soils of Oregon are well—yes, abundantly—supplied with phosphoric acid; that they surpass those of France in lime and equal them in potash. Below are contrasted analyses of some of the French sugar-beet soils with those of the natural divisions of this State and those of California. These results, I think, speak for themselves, and need no further comment.

Average comparative composition of soils.

Analysis of fine earth.	France.		Oregon.			California.
	Somme.	Nord.	Eastern.	Willamette Valley.	Southern.	
Insoluble matter	81.80	82.50	66.59	65.18	62.45	67.88
Soluble silica			13.12	5.02	8.74	8.96
Potash (K_2O)	.06	.14	.43	.23	.34	.64
Soda (Na_2O)	.09		.22	.18	.21	.28
Lime (CaO)	.51	.42	1.22	.83	2.22	1.08
Magnesia (MgO)			.75	.79	.80	1.49
Manganese (Mn_3O_4)			.10	.08	.25	.06
Iron (Fe_2O_3)	2.88	2.18	10.69	16.45	15.35	15.02
Alumina (Al_2O_3)	7.24	8.62				
Sulphuric acid (SO_3)			.04	.03	.01	.05
Phosphoric acid (P_2O_5)	.09	.08	.14	.21	.13	.08
Carbonic acid (CO_2)	.40	.70				
Water and organic matter	5.60	4.84	6.21	10.77	9.52	4.40
Other matter	1.85	1.52				
Humus			1.44	1.63	2.25	.75

Measured, then, by the foreign conditions as to temperature and the California conditions as to rainfall, and with a soil amply supplied with all the elements necessary to produce abundant crops, Oregon would certainly seem favored with all the requisites for success in beet culture.

The analyses made at the station during the season of 1891–92 may be summarized as follows:

County averages for 1891.

County.	No.	Sugar.	Purity coefficient.	County.	No.	Sugar.	Purity coefficient.
Benton	39	12.30	74.12	Marion	1	15.99	78.38
Clackamas	7	14.55	77.30	Polk	1	14.72	78.08
Columbia	1	13.74	79.42	Union	3	15.84	79.89
Douglas	9	12.99	73.45	Washington	11	13.96	78.79
Jackson	3	18.93	80.99	Yamhill	1	10.73	76.64
Lane	16	14.32	79.95				
Linn	5	13.54	79.91	Average	....	14.13	78.08

An examination of the results reveals that the analyses had a wide range, viz: From 6.77 per cent to 22.44 per cent sugar in the juice. Of the 95 analyses made, 8 fell below 10 per cent; 76 showed over 12 per cent, and 37 over 14 per cent sugar. An average of 81 analyses for the Willamette Valley shows 13.76 per cent sugar and a purity coefficient of 77.89; the average beet weighing a little over 1¼ pounds, while an average of 10 analyses of beets from southern Oregon showed 13.38 per cent sugar with a little larger beet. But this does not really show the capabilities of this section of the State, as will appear later, for there were quite a number of immature beets included in this average.

Experiments of 1892.—For the investigations of 1892 the following varieties were used, Desprez's Early Rose, Vilmorin's Improved, Kleinwanzlebener, and White Imperial, all of which are favorite kinds, the first being much used in California. Unfortunately the seed was delayed in reaching us, so it could not be distributed to the farmers as early as it should have been to secure the best results. Had the seed reached us in due time, it could have been put into the ground in April, for at that time there was favorable weather for seeding, but by the time the seed had been distributed cold weather set in and continued till May, after which the weather became very dry, rendering the conditions for a fair trial very unfavorable.

The rainfall for the season was below the normal and reports all read "very dry," "extraordinarily dry," "weather very unfavorable." In fact, nearly all the beets in the eastern portion of the State failed to mature, and in many instances the seed failed to germinate. So far as the season's climate is concerned, then, the experiments were greatly handicapped and we were "in pursuit of knowledge under difficulties."

The cultivation for this season was the same as for the previous year, except that the rows were placed 20 inches apart.

Owing to the disturbed condition of the experiment, the results are doubtless poorer than would have been the case had the season been one of more nearly normal conditions. Still, the results confirm the conclusions of the previous year, that Oregon possesses the conditions necessary for the production of excellent beets for the purpose of beet-sugar manufacture.

Expressed by counties the averages are as follows:

Averages for 1892 by counties.

County.	Number of analyses.	Average for 1892.	Purity coefficient.	County.	Number of analyses.	Average for 1892.	Purity coefficient.
Benton	17	12.80	86.50	Polk	5	14.50	73.30
Clackamas	1	15.10	87.83	Union	7	19.80	87.33
Douglas	9	15.20	81.15	Washington	10	15.50	78.79
Jackson	1	15.00	84.74	Yamhill	5	13.70	82.83
Lane	2	15.20	84.05	Josephine	2	15.70	88.00
Lincoln	3	16.20	83.00	Wasco	1	21.10	90.50
Linn	1	17.10	73.74	Malheur	1	20.20	84.90
Marion	2	13.80	74.60				

The average of all analyses for the State was 15.7 per cent sugar in the juice, with a purity coefficient of 78.08, against 13.75 per cent and a purity of 77.57 for the previous season. Out of the 65 analyses made, only 11 indicated less than 12 per cent sugar in the juice, and 41 samples indichted over 14 per cent, the extremes being 9.4 per cent and 23.8 per cent. The average for the different natural divisions of the State were as follows:

	Per cent.
Willamette Valley, 44 samples	14.7
Eastern Oregon, 11 samples	19.2
Southern Oregon, 10 samples	15.1

While from 1893 to 1897 no definitely outlined experiments have been conducted, yet the station has furnished more or less seed to various parties who have sent the beets to be analyzed. In other cases beet seed has been furnished by other parties, and analyses have been made in all cases when beets were forwarded to the station. The average of the results of 23 analyses made since 1892 shows 15.05 per cent sugar in the juice and a purity coefficient of 89.8.

Average of all results.—Let us now collect the results to 1897 which have been thus separately set forth. In the same table I beg to include the averages from analyses made at Washington, D. C., by the United States Department of Agriculture. These last-mentioned results really indicate a little too high, probably about 10 per cent, on account of the time that necessarily elapsed between harvesting and analyzing, which would result in a loss of water.

Expressed by counties the averages are as follows:

Average of all analyses for each county.

County.	Number of analyses.	Average of analyses made at station.	Purity coefficient.	Number of analyses.	Average for United States Department of Agriculture.	Purity coefficient.
Benton	42	12.57	79.63	5	14.34	82.8
Clackamas	8	15.62	78.76	3	15.36	84.2
Columbia	1	13.74	79.42	3	15.30	81.7
Coos	0			5	14.56	82.6
Douglas	18	14.10	77.98	1	17.74	84.3
Jackson	4	17.93	81.00	1	18.94	83.9
Lane	18	14.42	80.19	6	14.24	85.4
Lincoln [1]						
Linn	6	14.13	73.43	1	14.15	79.4
Marion	4	15.17	74.60	2	14.15	81.1
Polk	16	14.54	74.10	1	12.10	79.8
Union	30	18.61	85.10	2	14.35	81.8
Washington	2	15.29	80.98	3	12.49	80.7
Yamhill	7	12.87	82.76	0		
Josephine	2	15.70	81.21	0		
Wasco	1	21.10	90.50	0		
Malheur	1	20.20	83.44	0		
Sherman	0			1	13.55	72.2
Umatilla	0			1	15.12	80.9
Multnomah	1	16.90	76.80			

[1] Averaged with Benton County.

If we omit from the average those beets which were immature or overgrown, the averages for the State will be:

	Sugar.	Purity coefficient.
Season of 1891	14.3	78.2
Season of 1892	15.9	81.4
Since 1892	15.0	84.8
Mean	15.0	81.5

During the season just ended, 1897-98, the experiments were continued, but were limited for the most part to those portions of the State which seemed to offer not only the best conditions for growing beets, but also presented other favorable economic conditions, for unless the requisites for the manufacture of sugar can be had as well as the beets, it is useless to expend labor in an attempt to show that we can grow good beets. In these experiments the conditions were not particularly favorable—indeed, were adverse, inasmuch as the ground was entirely prepared in

the spring and the seed was late. The results obtained in the localities selected are given below:

County.	Weight.	Sugar.	Purity coefficient.
	Grams.	*Per cent.*	*Per cent.*
Washington	395	15.2	85.9
Clackamas	508	13.8	83.4
Union	477	17.5	88.4
Jackson	437	15.6	81.0
Miscellaneous	512	14.1	85.8

PENNSYLVANIA.

Fifty-nine samples of beets grown in Pennsylvania were received at the Department of Agriculture laboratory for analysis. The mean weight of the beets in the samples was 18 ounces, the mean content of sugar in the beet 13.8 per cent, and the mean coefficient of purity, 79.5. The size and sugar content of the samples received from the whole State were satisfactory, but the coefficient of purity falls a little below the minimum standard.

The samples received may be divided, for the purposes of study, into two sets, namely, those from counties lying in and north and west of the favorable thermal belt, and second, the counties lying south and east of that belt. Collected by counties, the samples divided according to the above classification show the following data:

Counties of Pennsylvania above and below isothermal line 70°.

County.	Number of samples.	Average weight.	Sugar in the beets.	Coefficient of purity.
Above 70°.		*Ounces.*	*Per cent.*	
Allegheny	13	18	13.8	77.0
Crawford	3	25	13.9	75.3
Elk	2	16	13.0	77.4
Erie	7	28	15.8	82.5
Mercer	2	34	15.4	83.7
Potter	1	18	18.0	81.1
Union	1	10	19.6	....
Lawrence	2	16	16.8	79.9
Averages, etc	31	21	14.8	78.9
Below 70°.				
Cumberland	22	12	12.2	79.6
Lebanon	1	24	14.4	79.0
Perry	2	31	15.7	82.2
York	3	25	13.9	80.2
Averages, etc	28	15	12.7	79.8

It will be seen that the 31 samples coming from the counties lying in and to the north and west of the favorable thermal belt have an average weight of 21 ounces, a mean content of sugar in the beet of 14.8 per cent, and a mean coefficient of purity of 78.9. The 28 samples coming from counties lying south and east of the favorable thermal belt have a mean weight of 15 ounces, a sugar content in the beet of 12.7

per cent, and a mean purity of 79.8. With the exception of the coefficient of purity, the influence of the more favorable thermal conditions is easily distinguished.

Of the counties in Pennsylvania furnishing the most data may be mentioned Allegheny, with 13 samples, having an average weight of 18 ounces, a mean content of sugar in the beet of 13.8 per cent, and a mean purity of 77. Cumberland County, in the southern part of the State, sent 22 samples, having a mean weight of 12 ounces, a mean content of sugar in the beet of 12 per cent, and a mean purity of 79.6. Erie County sent 7 samples, having a mean weight of 28 ounces, a mean content of sugar in the beet of 15.8 per cent, and a mean purity of 82.5. The samples from Erie County are decidedly the most favorable, and this is to be expected, since Erie County has conditions of soil and climate which are entirely analogous to those pervading the New York area from Albany to Buffalo.

Attention has been called before to the mountainous character of a large part of the State of Pennsylvania, even where favorable thermal conditions prevail. It is evident, however, that in the northern and western portions of the State, where suitable soil can be found, the culture of the sugar beet may be introduced under the most favorable conditions, and with every prospect of success.

EXPERIMENTS CONDUCTED BY THE AGRICULTURAL EXPERIMENT STATION.

The agricultural experiment station of Pennsylvania cooperated with the Department of Agriculture in the investigation of the beet-sugar work, and has published the results of its work in Bulletin No. 40 of that station. For details of the analytical work and of the observations made by the director of the station the reader is referred to the bulletin mentioned. In discussing the analyses Director Armsby says:

Of the 69 samples reported upon in the above table, 55 (or 80 per cent) showed over 12 per cent of sugar in the beet. Thirty-four samples (or 49 per cent) showed a coefficient of purity of over 80. Thirty-two out of the total number (or 46 per cent) showed over 12 per cent of sugar and also a purity coefficient of over 80. In view of the fact that practically all of the beets were raised by farmers who had had no experience in the culture of this plant for sugar, the results must be regarded as decidedly favorable so far as the quality of the beets is concerned.

In 40 cases out of the whole number we have data regarding the average weight of the beets. Of these 40 samples, 14 (or 35 per cent) weighed between 0.80 and 1.35 pounds, 18 (or 45 per cent) were below 0.80 pound in weight, and 8 (or 20 per cent) were above 1.35 pounds. It thus appears that, as a rule, the size of the beets was rather small.

Thirty-four of the experimenters reported the yield of beets. In most cases the yield was calculated from that of a comparatively small area, and in many cases there is evidence that the results may be considerably in error. Taking them as they stand, however, 10 (or 29 per cent) reported a yield of over 15 tons per acre, 2 (or 6 per cent) a yield of between 10 and 12 tons per acre, and 17 (or 50 per cent) a yield below 10 tons per acre. It thus appears that while, as stated above, the general quality of the beets was good, the yield was rather small.

As stated above, 32 of the samples showed more than 12 per cent of sugar with a purity coefficient of more than 80. Of these 32 experiments, 7 (or 22 per cent) reported a yield of over 10 tons per acre, 4 (or 13 per cent) a yield of between 8 and 10 tons per acre, 7 (or 22 per cent) a yield of less than 8 tons per acre, while 14 (or 44 per cent) did not report the yield. These figures confirm those given above in showing that the yield was, as a whole, rather small.

Rhode Island.

Only 2 samples were received from Rhode Island, and no deductions of any value can be made from such limited data. The average weight of the beets composing the samples was 21 ounces, the mean percentage of sugar therein 11.9, and the mean purity 74.2. These data of course are far from encouraging, but there are reasons for supposing that the climate of Rhode Island is favorable to the production of a much richer beet. The available area for cultivation in beets in Rhode Island is small, and it may not be worth while to prosecute the experimental work. Nevertheless, it is suggested that it might be profitable for the agricultural experiment station of Rhode Island to study the subject to a greater extent.

South Carolina.

Thirteen samples were received at the Department of Agriculture from South Carolina. The mean weight of the samples was 17 ounces, the percentage of sugar in the beet 9.9, and the mean purity 79.9. These data, taken into consideration with the latitude and thermal conditions, indicate that there is no prospect of South Carolina becoming a sugar-producing State.

South Dakota.

Only 5 samples of beets grown in South Dakota were received at the Department for analysis. The mean weight of the beets composing these samples was 17 ounces, the mean content of sugar in the beet 15.1, and the mean purity coefficient 83.2. These data are favorable, but too meager for the basis of any definite conclusions.

EXPERIMENTS BY THE AGRICULTURAL EXPERIMENT STATION OF SOUTH DAKOTA.

Extensive investigations in cooperation with the Department of Agriculture were carried on by the South Dakota station during the past season. The whole number of samples analyzed at the South Dakota station was 337. For convenience of classification they are grouped according to the different regions in the State, and by counties in the regions as is shown in the following table:

Averages by counties and regions.

[From report of Jas. H. Shepard, Chemist of Experiment Station.]

Region and county.	Number of samples.	Tons per acre.	Per cent stand.	Average weight.	Sugar in beets.	Purity coefficient.	Ash in the juice.
BIG STONE LAKE REGION.				*Grams.*	*Per cent.*		
Roberts County	3	24.6	90	387	15.3	88.0	0.85
Grant County	7	16.4	71	397	13.9	87.5	.90
Region averages	....	20.5	81	392	14.6	87.8	.88
UPPER SIOUX RIVER REGION.							
Codington County	4	15.7	60	473	12.9	85.1	.87
Deuel County	4	8.5	83	423	14.5	89.2	.60
Kingsbury County	14	23.1	85	359	14.0	86.2	1.00
Moody County	5	14.1	79	431	14.2	87.8	1.15
Lake County	4	16.6	72	424	13.8	81.2	1.09
Brookings County	26	19.8	74	455	13.4	86.7	.88
Minnehaha County	24	20.2	77	423	15.2	86.1	1.08
Region averages	....	16.9	76	427	14.0	86.0	.95
LOWER SIOUX RIVER REGION.							
Lincoln County	9	16.4	81	402	15.0	84.8	1.17
Turner County	9	18.2	55	437	14.5	85.1	1.12
Hutchinson County	1	19.5	80	333	19.5	88.4	1.20
Bonhomme County	10	17.5	77	449	15.4	87.2	.99
Clay County	18	30.5	88	470	14.7	86.2	1.15
Yankton County	22	19.7	77	498	14.6	86.0	1.03
Union County	18	19.3	79	388	15.2	88.5	.81
Region averages	....	20.2	77	425	15.6	86.6	1.06
CENTRAL JAMES RIVER REGION.							
Miner County	4	21.5	47	329	14.5	84.6	2.06
Sanborn County	7	14.2	64	373	15.5	87.4	.92
Davison County	9	30.1	81	470	14.8	86.4	.91
McCook County	2	22.5	75	423	15.0	89.0	1.03
Region averages	....	22.1	67	399	14.9	86.9	1.23
UPPER JAMES RIVER REGION.							
Marshall County	3	....	90	322	13.7	85.6	.76
Brown County	19	15.1	61	364	13.3	81.7	1.06
McPherson County	2	26.3	100	314	18.3	85.3	.73
Edmunds County	3	17.7	75	349	15.1	84.3	1.18
Day County	10	14.5	69	367	13.9	88.3	.91
Clark County	8	22.8	75	351	13.9	87.2	1.08
Spink County	5	19.1	75	362	15.5	89.1	1.09
Beadle County	13	33.6	77	475	14.5	86.8	1.06
Faulk County	2	12.8	95	304	18.0	89.5	1.28
Hyde County	2	14.3	50	488	14.6	84.7	1.00
Hand County	2	11.8	90	259	16.8	81.4	1.27
Region averages	....	18.8	78	360	15.2	85.8	1.04
UPPER MISSOURI RIVER REGION.							
Campbell County	2	12.3	55	427	17.7	89.2	1.20
Walworth County	2	16.6	95	389	14.9	84.8	1.11
Potter County	4	17.2	59	409	15.9	88.0	1.12
Sully County	1	12.5	90	525	14.3	86.7	1.12
Hughes County	3	8.3	55	399	14.8	85.3	1.09
Region averages	....	13.4	71	430	15.5	86.8	1.13
CENTRAL MISSOURI RIVER REGION.							
Jerauld County	6	11.0	76	290	15.3	84.5	1.28
Buffalo County	2	44.0	85	379	16.1	84.3	1.17
Brule County	7	17.2	75	375	16.2	82.4	1.38
Aurora County	5	14.7	73	394	16.6	86.7	1.10
Douglas County	2	16.8	70	286	16.4	87.8	.99
Charles Mix County	3	23.9	85	394	14.8	83.2	1.25
Region averages	....	21.3	77	336	15.9	84.8	1.19

Averages by counties and regions—Continued.

Region and county.	Number of samples.	Tons per acre.	Per cent stand.	Average weight.	Sugar in beets.	Purity coefficient.	Ash in the juice.
WHITE RIVER REGION.							
				Grams.	*Per cent.*		
Presho County	1	45.0	....	421	14.9	83.1	.90
Pratt County	1	33.0	100	445	14.3	82.0	1.07
Gregory County	1	....	....	263	16.4	80.8	1.22
Region averages	....	39.0	100	376	15.2	82.0	1.06
BLACK HILLS REGION.							
Meade County	10	16.1	75	401	16.8	82.1	1.19
Pennington County	5	9.5	79	330	16.4	82.7	1.48
Custer County	1	10.0	80	67	14.8	78.0	.47
Fall River County	4	15.4	90	325	15.9	83.7	1.35
Region averages	....	12.8	81	281	16.0	81.6	1.12
BUTTE REGION.							
Harding County	4	....	35	343	20.7	86.0	1.30
Butte County	4	33.8	78	471	16.5	89.4	1.18
Region averages	....	33.8	57	407	18.6	87.7	1.24
State averages	....	21.9	77	383	15.5	85.6	1.09

From an inspection of the above data it is seen that the results of the experiments conducted by the station are quite encouraging. The mean average weight of the beets analyzed was a little below the normal, 383 grams, equivalent to 13.5 ounces. The mean content of sugar in the beets was 15.5 per cent, and the mean purity coefficient 85.6. The data for yield per acre are probably unreliable, as many reports of tonnage are given which are evidently erroneous, as, for instance, in Presho County, where a yield of 45 tons per acre is reported, and in Pratt County, 33 tons per acre, a quantity of beets which is not to be expected under the most favorable circumstances of growth. In so far as producing a crop of beets rich in sugar is concerned, the conditions in South Dakota seem to be extremely favorable. Attention, however, should be called to former statements that the farmers of this State will have to contend with the great difficulty of an early and sudden coming of winter. If, therefore, the industry should secure a hold, this will be the most important point in the agricultural part of the work to be considered, namely, the harvesting and preserving of the crop for manufacturing purposes. The high purity coefficients which obtain in South Dakota are especially encouraging. There is no other State which has equaled South Dakota in the purity of the juices of the beets. There is abundant reason found in the data published above to encourage the agricultural experiment station of the State to continue its work of investigation, and to attract the favorable attention of intending investors.

TEXAS.

The northwestern portion of Texas reaches an altitude where the thermal conditions become more favorable to beet production. It is not to be expected that the southern and western portions of the State will ever be seriously considered for this purpose.

Eleven samples were received from Texas at the Department of Agriculture laboratory, having an average weight of 22 ounces, a mean content of sugar in the beets of 12.6 per cent, and a mean purity of 76.5. All the counties represented were in the northern and western portions of the State except McLennan, which is in the center. There is reason to believe that on the high plateaus in the northwestern portion of the State, where irrigation is possible, the culture of the sugar beet might be introduced with considerable prospects of success.

A few analyses were made by the agricultural experiment station of Texas, and these are given below:

REVIEW OF THE WORK DONE BY THE AGRICULTURAL EXPERIMENT STATION OF TEXAS.

All of the seeds that we received for distribution in this State during the past season came to hand too late for proper planting in a State so far south as Texas. For this reason the dry season prevented a fair growth of the beets at an important period in their development, and the crops waited for the fall rains to develop size. These fall rains were accompanied by a small per cent of sunshine, resulting in a low sugar content. These conclusions are based upon the fact that where beets were planted late and irrigated, the sugar content was higher than when samples were grown by late fall rains and then sent us for analysis. Of course the extreme western portion of the State produced beets of high sugar content.

Results of experiments in Texas.

Name and address of persons from whom beets were received.	Section of State.	Laboratory number.	Brix.	Sucrose.	Purity coefficient.	Weight.	
						Lbs.	*ozs.*
R. B. Edgell, Clarendon, Donley County, Tex.	Panhandle □	1	16.8	11.88	70.68	1	10
D. W. Ruckston, Silverton, Briscoe County, Tex.	do	1	15.5	9.69	62.5	2	4
Do	do	2	17.0	11.02	64.82	2	6
Do	do	3	14.0	6.89	49.19	2	10
Do	do	4	13.2	7.98	60.91	3	11
R. L. Goble, Garrett, Ellis County, Tex.	Black Land Belt □	(*)	13.5	7.79	57.7	1	11
L. H. Carpenter, Silverton, Briscoe County, Tex.	Panhandle □	1	15.2	6.27	41.8	1	5
Do	do	2	13.5	4.89	36.9	1	11
Do	do	3	11.0	5.04	45.7	2	6
Do	do	4	11.3	5.46	48.34	3	2
F. E. Davis, Dublin, Erath County, Tex.	Central North □	†1	12.55	7.07	56.04	2	11
		1	16.5	9.69	58.7	1	7
C. W. Griffin, Toyahvale, Reeves County, Tex.	Pecos Region □	†1	15.0	9.5	63.3	1	6
Do	do	2	21.1	15.08	71.5	1	8½

* 4 beets, 1 sample. † Red.

TENNESSEE.

Seventeen samples of beets were received at the laboratory of the Department of Agriculture from Tennessee, of which eight were from the agricultural experiment station at Knoxville. The mean weight of the beets received was 11 ounces, the mean percentage of sugar 10.8, and the mean purity 71.9. The mountainous regions of Tennessee are probably favorably situated in regard to thermal conditions for the

growing of beets, but the contour of the country will prevent any extensive planting of this crop. Middle and western Tennessee are evidently too warm for successful beet culture.

VIRGINIA.

Thirty-four samples grown in the State of Virginia were received at the Department of Agriculture for examination. The mean weight of the beets composing these samples was 21 ounces, the mean content of sugar in the beets 11.6 per cent, and the mean purity 76.2.

Virginia lies almost entirely south of the region where thermal conditions are most favorable to beet culture. It is only in the seacoast counties, where the temperature is moderated by the sea breezes, and in the mountainous counties, where the altitude is great enough to lower the temperature, that good results can be expected. A great deal of interest has been manifested in the State in regard to the building of factories, but it is evident that intending investors as well as farmers should stop to consider the matter very seriously before investing their money and their labor in this enterprise.

A few analyses received from Virginia show favorable results, as for instance, the sample from Carroll County, weighing 15 ounces, and containing 15.4 per cent of sugar in the beet. There is little in the data, however, to encourage the belief that Virginia is a favorable region for beet growing.

Investigations were also made by the agricultural experiment station of Virginia, but only to a very limited extent. The data obtained on analysis, together with the observations of the official in charge of the investigations, are found in the following report:

INVESTIGATIONS BY THE AGRICULTURAL EXPERIMENT STATION OF VIRGINIA.

Before stating the results of the analyses made at this station I think it best to make some comments upon the work attempted this season. In the first place, it was quite late before we concluded to undertake the distribution of seeds and then by the time they reached us from the Department of Agriculture the season was so far advanced that a considerable number of persons to whom the seeds were distributed failed to plant them. This, of course, disturbed the experiment to a considerable extent. Another disturbing factor was the extreme drought which prevailed during the latter part of the season over this State in general, which resulted in many cases in practically destroying the crop. As a consequence, our results are not what we could wish. After much correspondence with those to whom seed was distributed, we concluded to analyze only samples representing fairly well the tide-water and limestone sections of the State. The results of these analyses follow:

Sample No. 1. From W. J. Phillips, Accomac County, Va. Weight of whole beet, 372 grams. Per cent of sugar, 16.11.

Sample No. 2. From Henry Jones, Suffolk, Nansemond County, Va. Weight of whole beet, 1,325 grams. Per cent of sugar, 4.17.

Sample No. 3. From L. T. Barnes, Boulevard, New Kent County, Va. Weight of whole beet, 581 grams. Per cent of sugar, 14.64.

Sample No. 4. From T. A. Eller, Atkins, Smyth County, Va. Weight of whole beet, 760 grams. Per cent of sugar, 9.61.

Sample No. 5. From experiment station. Weight of whole beet, 584 grams. Per cent of sugar, 13.63.

The first three samples represent the eastern section of the State and the last two the limestone section. We endeavored to secure sixteen samples covering more perfectly the geologic areas of the State, but from the causes above mentioned we failed to procure proper samples.

Dr. McBryde desires me to say that if the Department wishes us to aid in the conduct of this work the coming year we will be pleased to do so, and that the work will be taken in hand in proper season and the growing experiments arranged on a much better plan, so as to secure reliable samples from the different sections of the State.

Experiments in the growth of beets in Virginia during 1897 were also made by the State board of agriculture, and are described on page 206 of the annual report of the board for the year 1897. One hundred and eight samples were analyzed during September and October. It is stated in this report that these samples varied in saccharine strength from 8.5 to 17.1 per cent; thirty-five of them were below 12 per cent, and seventy-three showed a saccharine value of from 12 to 17.1 per cent, with a coefficient of purity of from 79 to 88.5, or a saccharine average of 14.7 per cent, and an average purity coefficient of 85, which is equivalent to 250 pounds of raw sugar per ton of beets.

The data obtained by the State board of agriculture are more favorable than those secured by the Department of Agriculture or by the experiment station at Blacksburg. It is hardly probable, however, that the map which accompanies the report of the State board of agriculture will be regarded as a final judgment in regard to the localities in Virginia suitable to the growth of beets of the different qualities noted. A much larger series of experiments, extending over a greater number of years, will be necessary to definitely determine that point.

WASHINGTON.

Thirty-four samples of beets grown in the State of Washington were received at the Department of Agriculture for analysis. The mean weight of the beets received was 27 ounces, the mean percentage of sugar 13.7, and the mean purity coefficient 80.7.

The agricultural experiment station of the State of Washington for many years has conducted careful studies in regard to the possibilities of producing sugar in that State. During the past year 60 samples of beets grown in Washington were analyzed at the laboratory of the agricultural experiment station. The mean weight of the beets analyzed was 23 ounces, the mean percentage of sugar in the beets 13.6, and the mean coefficient of purity 75.7. Of the whole number 68 per cent contained over 12 per cent of sugar, and 78 per cent weighed more than 16 ounces. The reports of the director and chemist of the station are given below.

Summary of analyses of beets from Washington.

[Compiled from report of experiment station.]

County.	Number of samples.	Net weight beets.	Sugar in beets.	Coefficient of purity.	County.	Number of samples.	Net weight beets.	Sugar in beets.	Coefficient of purity.
		Ounces.	*Per ct.*				*Ounces.*	*Per ct.*	
Clarke	1	29	14.3	77.7	King	10	15	12.1	71.4
Pierce	7	25	12.0	73.7	Clallam	1	54	14.3	77.4
Lincoln	20	17	15.8	79.2	Whitman	2	46	14.2	76.3
Kitsap	2	22	12.3	70.9	Klickitat	2	26	12.4	74.5
Skagit	8	33	12.5	72.9					
San Juan	4	27	13.5	75.6	Averages, etc.	60	23	13.6	75.7
Whatcom	3	25	11.8	80.4					

RESULTS OF EXPERIMENTS IN WASHINGTON.

I have the honor to report as follows:

The appointment was made so late in the summer that it served only the purpose of providing for the free transportation of beets to this point for analysis, consequently the report must necessarily deal with facts of an earlier date chiefly, if it is to be of any value as an indication of the adaptability of the soil and climate of the State of Washington to the culture of sugar beets. Permit me to say that we regarded our experimentation as practically complete before the beginning of this year. In consequence of this fact it had been announced early in the season that no distribution of seed would be made. At a later period some seed was obtained from the Department of Agriculture. The planting season in Washington begins very early considering the latitude, and the seed was received too late for general use. Seed was, however, supplied to those requesting it, and in the main these requests were from localities not so well adapted to the culture of sugar beets, so that the results of this year's planting can in no way be taken as representative.

The Washington State Experiment Station began the investigation of this problem through its chemical department in the spring of 1894, and conducted it with the greatest thoroughness through that and the two succeeding seasons, making more than 3,000 analyses. Beets were raised in both small and large plats. The results were so uniform as to demonstrate the peculiar adaptability of this region to the culture of sugar beets. These results are given in Bulletins 15 and 26 of the State experiment station. I submit herewith the report of Professor Fulmer, of the department of chemistry, relative to the results of this year. I might mention the fact that Professor Fulmer was for some time chemist of a beet-sugar factory in Nebraska, and is particularly well fitted for dealing with this subject. The results thus far obtained in the State show a percentage of sugar of about 15, and a purity of nearly 84.

PULLMAN, WASH., *January 6, 1898.*

DEAR SIR: In compliance with your request I hand you herewith a tabulated statement of the analyses made in the station laboratory of beets grown from seed furnished by the United States Department of Agriculture. The data presented are far from being complete. The very important item of "variety of seed" is entirely omitted, because in almost all cases the variety indicated by the grower of the beets was not at all in harmony with the characteristics exhibited by the samples. For example, beets with pink skins were often marked "Kleinwanzlebener," which is a pure white variety. It is quite clear to my mind that the lack of harmony between the character of the beets and the names they bore was due to the seed sent out by the Government being a mixed seed.

Parties sending in beets for analysis failed in most cases to send any data concerning the time of planting, thinning, and harvesting; character of soil; amount of cultivation, etc. On account of this great lack of reliable data, the meager results obtained are of little value.

I wish to direct your attention to the fact that this kind of experimental work with sugar beets in our State is at this time a useless expenditure of time and energy. During the past four years this station has made over 3,000 analyses of sugar beets grown in all parts of the State, and under all conditions of temperature and rainfall. The details of these analyses, and of the field experiments, have been published in full in Bulletins 15 and 26. The raising of high-grade beets in this State has been fully demonstrated to be a practical success, and we believe any further experimentation with small plats is wholly unnecessary.

The uniformly excellent results that we have obtained in the past are in striking contrast to the very poor outcome of this year's test. We believe the low sugar content and purity exhibited by the beets this year is due to several causes:

(1) The seed from Washington was received altogether too late in the spring for distribution in time for early planting. In most sections of the State the seed should be planted not later than the middle of April.

(2) Nearly all of the samples were grown in sections of the State that have not heretofore shown any special adaptability to sugar-beet culture.

(3) We believe the seed was of poor quality. In support of this assertion I wish to call your attention to the samples that were raised at Crescent, in Lincoln County. Heretofore this section has always produced high-grade beets. The samples sent in by William Adam, P. Carstens, and the first two of W. B. Warren were grown from Government seed, and gave a very low sugar content and purity. The samples of Wollweber, and the last three of Warren, were grown from seed raised at Crescent last year, and gave most excellent results. These facts and the very general poor quality of samples leads me to regard the seed furnished as an inferior quality.

The inclosed results do not do justice to our State, and I wish to protest against their publication as an index of the character of beets that can be raised here.

Yours, very respectfully,

ELTON FULMER,
Chemist Experiment Station.

Director E. A. BRYAN,
Pullman, Wash.

In regard to the report of the chemist, attention should be called to the fact that he is evidently mistaken in regard to the quality of the seed sent by the Department of Agriculture. This seed was, of course, not of the direct production from high-grade mother beets, but was the ordinary commercial seed which was imported by the Oxnard Company for distribution among their beet growers. It was the same seed which was sent to Michigan and to New York, which produced in those States the excellent results which have been recorded in previous portions of this report. In over 2,200 analyses of beets which were made in this laboratory during the past season, only about 25 samples were received which had a pink skin, and in most cases these were marked with different names. It is possible, however, that a few seeds of this kind may have been mixed in with the large lot of commercial seeds which were imported into this country. The Department of Agriculture neither purchased nor packed the seeds which were dis-

tributed, so that the possible admixture of other varieties can not be positively denied.

With the exception of the excessive rainfall on some of the coast areas, it has been demonstrated that the State of Washington is well suited to the growth of beets of a high grade. An extended report on the possibilities of Oregon and Washington for beet production was made in Bulletin No. 5 of this Division, the investigations, which were published in 1885, having been made in the autumn of 1884. A description of the topographical features and climate of western Washington is given on pages 103–104 of that bulletin. The conclusions which I derived from a study of the conditions at the time are given on page 105 in the following words:

"In view of the preceding description I am inclined to believe that in Washington Territory and Oregon, soil and climate are very favorable to the growth of a sugar beet of high saccharine strength.

"The mildness of the winter is, though to a less degree than in California, favorable to the season of manufacture. With a wise and careful encouragement of the industry I have no hesitation in saying that the prospects for the development of an indigenous sugar industry in the extreme northwestern part of our country are decidedly bright. It is a field worthy the attention both of experimenters and capitalists."

Investigations which have been made subsequent to this period have abundantly verified the predictions given above. The chemist of the station, in the results of his work for 1897, says that the data are not so favorable as were obtained in preceding investigations, but, as he says, the beets analyzed came from parts of the State less favorable to beet culture than did those samples which had previously been examined. The data obtained by analyses of beets received at the Department from Oregon are decidedly favorable. The average size of the beets, 27 ounces, shows the possibilities of a large yield, while both the content of sugar and the purity coefficient are favorable to the production of large quantities of sugar from the beets produced. The thermal conditions which prevail in Washington are noticed in another place. The coast region is cooler than the mean temperature of 69° for the summer months, but, as has been remarked before in more than one place, this is not unfavorable to the production of high-grade beets; on the contrary, rather promotive of it. The mild autumns, especially in the western part of the State, afford ample opportunity for the complete harvest and care of the beets. In considering the data which have been obtained through a long series of years, therefore, it is safe to say that there are extensive areas in the State of Washington which invite the careful consideration of intending investors in the beet-sugar industry.

Wisconsin.

Forty-two samples of beets were received at the laboratory of the Department from Wisconsin, of which number 31 were grown in Dane County, representing the beets grown by the agricultural experiment station. It is evident, that the mean results of the samples from Wisconsin are influenced in a marked degree by those obtained from the agricultural experiment station. These mean results therefore represent a higher quality of beets than would have been grown in the promiscuous manner already referred to. The mean weight of the beets grown in Wisconsin was 15 ounces, the mean content of sugar therein was 15.8 per cent, and the mean purity 83.3. The small mean size of the beets is due chiefly to the 31 samples received from the agricultural experiment station, of which the average weight was only 11 ounces. With the exception of 1 sample from Outagamie County, which weighed only 8 ounces, the other samples were of good size. Especially is this true of the 3 samples received from Racine County, the mean weight of which was 34 ounces, the mean content of sugar 15.4 per cent, and the mean purity 82.6.

The data obtained by our analyses are encouraging, but, on account of the small number of samples, not convincing. Therefore the following report of the results of the analyses made at the agricultural experiment station will show more conclusively the influence of the character of the soil and climate of Wisconsin on the quality of sugar beets.

EXPERIMENTS CONDUCTED BY THE AGRICULTURAL EXPERIMENT STATION OF WISCONSIN.

Three classes of experiments were conducted by the agricultural experiment station of Wisconsin during the year 1897. An elaborate report of these experiments has already been printed as Bulletin No. 64 of that station. The following interesting summaries represent the principal data obtained:

The three methods were the following:

First method.—A general distribution of seed was made promiscuously to farmers in the State who desired to experiment. In all, 13,766 packages were distributed. Each package contained directions for planting and cultivating the beet. One thousand six hundred and sixty-three samples of beets grown under these auspices were received at the station for analysis. The quality of the beets, together with the analyses of beets grown in 1890, 1891, 1892, and 1897, with a summary for the four years, is shown in the table on page 120.

Results of analyses of sugar beets grown on Wisconsin farms during 1890–1892 and 1897.—Averages by counties.

County.	1890-1892.				1897.				Summary for four years.			
	Number of samples.	Sugar in juice.	Purity coefficient.	Estimated yield per acre.	Number of Samples.	Sugar in juice.	Purity coefficient.	Estimated yield per acre.	Number of samples.	Sugar in juice.	Purity coefficient.	Estimated yield per acre.
		P. ct.	*P. ct.*	*Tons.*		*P. ct.*	*P. ct.*	*Tons.*		*P. ct.*		*Tons.*
Adams	3	11.99	76.1	9.3	6	13.67	75.5	10.2	9	13.11	75.9	9.8
Ashland	......	......	......	......	5	11.42	74.2	3.0	5	11.42	74.2	3.0
Barron	3	12.74	77.0	17.7	15	12.94	74.3	12.0	18	12.90	74.7	14.1
Bayfield	......	......	......	......	1	10.96	73.5	16.5	1	10.96	73.5	16.5
Brown	4	10.75	74.9	17.9	101	13.12	75.5	14.0	105	13.03	75.5	14.3
Buffalo	9	13.48	77.4	15.9	8	12.96	75.3	11.2	17	13.24	76.4	13.0
Burnett	......	......	......	......	2	12.92	75.0	18.0	2	12.92	75.0	18.0
Calumet	8	16.67	82.6	14.7	48	12.61	72.4	11.8	56	13.19	73.8	12.1
Chippewa	13	12.72	77.5	23.6	34	12.18	74.2	11.7	47	12.25	75.2	15.1
Clark	7	14.15	81.4	10.9	61	11.97	74.9	11.7	68	12.19	75.6	11.6
Columbia	19	12.28	74.7	15.5	30	12.68	71.8	13.4	49	12.53	72.9	14.2
Crawford	4	10.09	72.0	15.3	2	12.09	72.3	9.7	6	10.76	72.1	13.1
Dane	14	12.98	76.7	14.4	44	13.51	71.3	12.7	58	13.37	72.6	13.2
Dodge	13	11.77	76.2	20.7	47	12.86	71.9	12.5	60	12.62	73.0	13.8
Door	3	14.59	80.0	21.4	15	15.11	77.4	10.0	18	15.02	77.7	13.0
Douglas	......	......	......	......	8	13.92	78.8	16.7	8	13.92	78.8	16.7
Dunn	13	12.49	79.8	11.5	26	12.97	73.7	12.6	39	12.86	75.6	12.2
Eau Claire	10	11.70	76.0	14.0	63	10.70	73.8	11.0	73	10.84	74.1	11.5
Fond du Lac	10	12.13	74.1	11.0	38	12.04	71.2	16.6	48	12.07	71.7	15.1
Forest	1	9.64	72.5	6.0	1	11.31	70.2	15.0	2	10.47	71.3	10.5
Grant	9	10.24	69.3	13.2	26	12.21	71.2	13.0	35	11.74	70.5	13.0
Green	6	12.84	77.5	15.2	4	10.16	65.5	14.0	10	11.77	72.7	15.0
Green Lake	1	11.31	78.1	......	13	12.06	72.9	11.5	14	12.01	73.2	11.5
Iowa	7	11.32	74.9	27.8	1	10.40	70.2	12.0	8	11.20	74.3	22.5
Iron	......	......	......	......	1	9.96	64.7	15.5	1	9.96	64.7	15.5
Jackson	1	7.79	65.6	......	64	11.57	77.4	10.6	65	11.51	77.2	10.6
Jefferson	23	13.96	79.0	17.5	13	13.55	72.8	15.0	36	13.81	76.8	16.5
Juneau	6	13.04	76.0	25.3	9	12.34	72.9	6.2	15	12.63	74.1	13.2
Kenosha	1	12.71	78.1	21.8	13	14.31	74.2	15.0	14	14.19	74.5	15.7
Kewaunee	30	13.58	77.1	35.1	74	13.38	75.4	14.2	104	13.44	75.8	16.8
La Crosse	10	12.58	76.1	15.2	60	12.75	80.6	12.5	70	12.72	79.9	13.0
Lafayette	4	12.27	77.0	26.4	6	10.47	66.3	9.4	10	11.19	70.6	16.0
Langlade	1	12.91	81.4	24.1	15	11.51	70.8	11.0	16	11.59	72.1	12.0
Lincoln	3	17.43	85.9	13.1	7	13.09	75.9	4.5	10	14.39	78.9	10.9
Manitowoc	16	12.61	80.4	16.4	49	13.42	74.9	14.4	65	13.22	76.3	14.8
Marathon	9	12.67	76.5	16.1	44	11.99	72.3	12.4	53	12.10	73.0	12.9
Marinette	2	8.77	64.5	28.5	27	13.23	76.6	9.5	29	12.92	75.7	10.9
Marquette	......	......	......	......	15	13.19	77.7	8.0	15	13.19	77.7	8.0
Milwaukee	6	15.51	83.4	19.8	14	14.17	77.7	15.2	20	14.57	79.4	18.4
Monroe	16	12.32	76.2	12.3	24	12.36	73.1	11.4	40	12.34	74.3	11.8
Oconto	12	13.76	80.7	13.5	11	15.48	79.6	17.4	23	14.56	80.2	15.1
Oneida	......	......	......	......	4	13.78	75.5	......	4	13.78	75.5	......
Outagamie	14	11.48	75.2	23.6	63	13.06	75.4	15.0	77	12.77	75.3	16.6
Ozaukee	5	13.14	79.0	20.7	17	14.00	75.7	11.1	22	13.81	76.5	13.0
Pepin	5	14.71	79.1	11.9	4	11.82	73.7	23.5	9	13.43	76.6	17.7
Pierce	......	......	......	......	12	12.56	73.2	15.0	12	12.56	73.2	15.0
Polk	1	11.09	75.4	......	5	11.90	72.6	17.3	6	11.76	73.0	17.3
Portage	8	12.02	75.1	12.5	33	13.12	73.2	8.3	41	12.91	73.6	9.3
Price	......	......	......	......	7	10.43	67.2	11.0	7	10.43	67.2	11.0
Racine	4	14.27	80.6	10.5	17	13.75	75.3	14.3	21	13.85	76.3	13.9
Richland	9	11.34	79.6	12.9	15	10.61	68.7	15.3	24	10.88	72.8	14.4
Rock	17	12.96	76.7	11.4	36	13.97	73.5	15.1	53	13.64	74.5	14.0
St. Croix	8	12.55	74.7	19.9	18	12.11	72.2	13.3	26	12.24	73.0	15.3
Sauk	8	9.67	71.5	23.8	23	12.78	72.4	13.0	31	11.98	72.2	14.8
Sawyer	1	10.69	73.8	26.1	......	......	......	......	1	10.69	73.8	26.1
Shawano	7	12.53	76.3	16.9	28	13.35	75.0	8.2	35	13.19	75.3	10.4
Sheboygan	27	11.71	74.3	16.8	55	12.96	78.0	15.1	82	12.55	76.8	15.6
Taylor	15	13.61	78.9	8.8	10	10.87	70.6	13.6	25	12.52	75.5	11.0

It will be noticed that the table includes the analyses of 527 samples collected during the years 1890–91–92, together with the 1,663 collected in 1897, or a total of 2,190 samples. In the discussion of the analytical data Mr. F. W. Woll, who has compiled the report, makes the following interesting observations:

Sixty-eight of the counties of the State are represented in the sugar-beet analyses made during the past season. Brown county leads with 101 samples of beets,

Kewaunee being second with 74 samples. Ten counties furnished 50 or more samples each. The highest average for the sugar in the juice, 11 samples analyzed, was obtained for Oconto County, namely, 15.48 per cent with a purity coefficient of 79.6, followed by Door County, which gave 15.11 per cent sugar in the juice, purity 77.4, as the average of 15 samples. The average sugar content of the juice of the beets was above 12 per cent in case of 49 counties, above 13 per cent in case of 26 counties, and above 14 per cent in case of 8 counties.

Adaptability of different parts of the State to sugar-beet culture.—A close study of the results given in the preceding tables will be of interest, and is necessary in order to properly understand the situation of the question of sugar-beet culture in our State. The table indicates what an investigation continued through four growing seasons has revealed as to the adaptability of the soil in different parts of the State to the culture of this crop. In case of a few counties, especially the extreme northern ones, the number of analyses made is not sufficiently large to warrant our drawing definite conclusions as to the quality of beets there grown, but in the large majority of counties the number of analyses is ample to be considered a true representation of what beets grown in the respective counties will show when raised by farmers who have no special knowledge of the requirements of the sugar beet as to culture, soil, etc.

If the averages of the sugar contents for the various counties, as given in the last table, be marked on a Wisconsin map, and the counties whose averages come, say, above 13 and above 14 per cent of sugar in the juice be shaded, it will at once be noticed that the counties producing the richest beets are those lying east and southeast of the Wisconsin River, and those in the northwestern corner of the State along the Mississippi and St. Croix rivers, from Buffalo County and north. The Lake Shore region is shown to be peculiarly well adapted to the culture of sugar beets; all counties producing beets with an average content of sugar in the juice above 14 per cent in the past season's analyses border on Lake Michigan or are adjacent to counties bordering on this lake.

Mr. Woll is also of the opinion that those soils of the State which have been derived from limestone are best suited to the growth of sugar beets. He makes the following comment in regard to the sugar content of the beets:

Sugar content of beets.—The table shows that the average per cents of sugar in the juice for the years given were as follows: 1890–1892, 12.76 per cent; 1897, 12.67 per cent, or an average of 12.70 per cent for the years 1890–1897, the last figure being the mean of nearly 2,200 analyses. The usual minimum standard for beets adapted to factory purposes is 12 per cent sugar in the beet. Since beets contain about 95 per cent of juice, this will correspond to $\frac{12}{95} = 12.63$ per cent of sugar in the juice. Our average therefore exceeds this minimum figure by a small fraction of 1 per cent.

The influence of the character of the soil upon the weight, sugar content, and purity of the beets is summarized by Mr. Woll in the following statements:

In the sections of our State where exclusive grain raising has given way to diversified farming, dairying, stock raising, or market gardening, the land is usually in a good state of fertility, and a sufficient amount of barnyard manure is produced every year so that no artificial fertilizers need be purchased. But where grain raising is still continued as the sole reliance of the farmers, there is no hope for sugar-beet culture until the system of farming is changed, and the manure produced by the stock kept is carefully saved and applied, or commercial fertilizers are purchased for the beet fields.

Second method.—The second line of investigations conducted by the experiment station consisted in the establishment of substations in different parts of the State. As was mentioned in a previous part of this report, this is by far the most hopeful manner of conducting an agricultural survey of the State for the purpose of determining its suitability for the growth of sugar beets. In all, 33 farmers who took charge of this substation work made complete reports to the central station. The average expense per acre reported by 32 of these was $28.73. One report, showing an expense of $94.34 per acre, was excluded from the average. The average yield per acre, as reported from the 33 stations, was 29,850 pounds, or 14.9 tons of 2,000 pounds each per acre. This yield includes only 27 returns, since 6 of the substations failed to return the yield per acre. The lowest yield per acre reported was 6 tons, and the highest 24.8 tons. The average result of the analyses of the samples from the different substations is shown in the following table:

	Weight of beets.	Sugar in juice.	Purity coefficient.	Weight of beets.	Sugar in juice.	Purity coefficient.
	Pounds.	*Per cent.*	*Per cent.*	*Pounds.*	*Per cent.*	*Per cent.*
Average for 23 substations in southern half of State (30 and 31 samples, respectively)	1.17	13.58	80.0	1.79	15.35	79.0
Average for 13 substations in northern half of State (17 and 15 samples, respectively)	1.42	13.35	81.7	1.59	14.97	82.5
Average for 36 substations (47 and 46 samples, respectively)	1.26	13.49	80.6	1.72	15.22	80.2

For the first attempt at collecting data by a complete agricultural survey, the above results may be regarded as exceedingly encouraging. With larger experience on the part of the farmers in charge of the experiments, however, much more valuable and convincing data might be obtained.

Third method.—The third class of experiments conducted by the Wisconsin station consisted in investigations at the station farm itself. For the details of these experiments Bulletin 64 may be consulted. The following is a summary:

The field selected for the experiments was divided into two portions. The eastern half had been a meadow continuously since it came into cultivation up to 1895, when rape was grown thereon, followed by a crop of peas in 1896. The western half of the field had been plowed only once during the past twenty years, when it was cultivated in Indian corn. It had been pastured during the past ten years until 1896, when it was planted to rape and the rape eaten off by sheep. The beet crop did not do well on this field, the whole northwestern portion of it, after the 1st of August, showing no increase in the growth of the beets, the foliage turning yellow and the plants dying away to a large extent. The field was plowed 6 inches deep on May 7, and plowed again 12 inches deep on May 20. About four-fifths of it

was subsoiled to a depth of 6 inches. The agricultural analytical data obtained from this field are given in the following table:

Yield of beets and of sugar per acre, main field.

No. of plat.	Name of seed.	Eastern half.				Western half.			
		Yield of beets from plat.	Yield of beets per acre.	Sugar in the beet.	Sugar per acre.	Yield of beets from plat.	Yield of beets per acre.	Sugar in the beet.	Sugar per acre.
		Pounds.	*Pounds.*	*Per ct.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	*Pounds.*
1	Kleinwanzlebener, Neb	3, 422	24, 010	12. 72	3, 059	2, 874	25, 030	15. 80	3, 959
2	Desprez, Men	2, 826	22, 060	11. 71	2, 543	3, 122	30, 230	13. 71	4, 144
3	Kleinwanzlebener, Agnew	3, 053	21, 450	10. 96	2, 352	2, 301	32, 120	15. 17	4, 873
4	Kleinwanzlebener, Hoerning	2, 875	20, 160	15. 04	3, 038	1, 299	20, 210	17. 06	3, 448
5	Vilmorin Improved	2, 221	15, 610	14. 68	2, 291	1, 308	15, 030	14. 28	2, 141
6	Vilmorin Kleinwanzlebener	2, 473	17, 380	10. 65	1, 850	2, 728	23, 770	14. 98	3, 561
7	Vilmorin French	2, 485	17, 460	11. 26	1, 966	2, 701	23. 540	13. 58	3, 196
8	Kleinwanzlebener, Floto*	2, 258	15, 860	14. 24	2, 259	1, 472	12, 820	14. 05	1, 801
9	Desprez White, No. 2*	2, 081	14, 620	10. 95	1, 602	1, 429	12, 460	14. 38	1, 790
10	Desprez White, No. 2 B*	2, 108	14, 810	15. 05	2, 228	1, 408	12, 270	11. 71	1, 436
11	Wernich's Kleinw., Floto*	2, 111	14, 840	15. 65	2, 320	1, 236	10, 760	13. 62	1, 467
12	Demesmay*	1, 321	15, 510	14. 23	2, 207	799	11, 600	10. 28	1, 192
13	Kleinwanzlebener, Neb. (2)*	887	20, 760	15. 83	3, 287	355	10, 300	10. 75	1, 058
	Averages, etc	30, 121	18, 043	13. 22	2, 385	23, 032	18, 472	14. 18	2, 620

* Not included in average for western half.

The cost of cultivating this field is given as follows:

Cost of growing an acre of sugar beets.—A careful account was kept throughout the season of the labor done on the 3-acre beet field; valuing labor as previously given, we have the following summary:

Plowing and preparing the land	$12. 42
Planting	1. 70
Cultivating, hoeing, thinning and transplanting	51. 63
Harvesting and placing in cellar	31. 60
Total	97. 35

This sum, $97.35, or $32.45 per acre, does not include the cost of seed or rent of land. It is nearly $4 higher than the corresponding figure obtained as the average for 28 substations; the greater cost with us is easily accounted for by the weedy condition of the western half of the field, as well as by the fact that the harvesting of our beets was a comparatively slow and difficult job, since the different lots and varieties had to be harvested and kept separately.

In addition to the work summarized above the station took part in the growth of high-grade beets on special plats under the supervision of the Department. The results of these experiments are given in another place.

WYOMING.

Thirty-four samples of beets grown in Wyoming were received at the Department of Agriculture for analysis. The mean weight of the beets received was 19 ounces, the mean content of sugar in the beet 17.2 per cent, and the mean purity 82.3. These data are exceptionally fine, and show that, in so far as the production of a crop is concerned, Wyoming will be able to compete with any State in the Union. The thermal conditions which prevail in the State are extremely irregular, the low valleys having warm and the high plateaus cool summers. It

is evident that only on the plateaus, where the land is reasonably level, and where irrigation can be practiced, will it be possible to grow, with absolute certainty, a crop of beets of high saccharine strength.

Among the counties of Wyoming the two which furnish the most data are Converse and Big Horn. Converse County lies in the southeastern part of the State and Big Horn in the northwestern. In the beets from Converse County the average weight was 26 ounces, the mean content of sugar 17.8 per cent, and the mean coefficient of purity, 82.2. Big Horn County furnished six samples, of which the average weight was 20 ounces, the mean content of sugar 18.7 per cent, and the mean coefficient of purity 82.2.

When these analyses were made, showing such fine results, we wrote at once to the parties to see if we could not get a quantity of the beets for mothers in producing beet seed. The reply was made that they had all been frozen, and therefore no samples could be furnished. This reply to our inquiry indicates the chief difficulty to be encountered in Wyoming in introducing the beet industry, namely, the sudden advent of cold weather and the severity of the early winters in that locality. In Big Horn County some of the altitudes are 10,000 feet, and the whole county has a very great elevation. In the southeastern portion of the State the altitude generally reaches 7,000 feet. It is evident, therefore, that these high elevations give cool summers and favor the early advent of winter.

Another point to be considered is the mountainous character of the State, which, of course, precludes the possibility of culture over extensive areas. In low valleys protected by mountain ranges, if from 15,000 to 25,000 acres of land in a body could be secured, it seems probable that the industry of beet growing might be introduced with every probability of success. The temperature conditions, however, of October and November should be most carefully considered, as it would doubtless be necessary, even in the most favored valleys of Wyoming, to have the beets securely protected by the middle or end of November. This short harvesting season can not help but add a great deal to the cost of production, and hence must be taken into consideration.

In that part of the country also the question of the supply of water is a very important factor, and must not be lost sight of, as not only will water be required for the growing of crops, but also in immense quantities for manufacture.

The data at hand only permit us to study the composition of the beet itself, and surely Wyoming is to be congratulated on having produced, judged from the limited number of samples supplied, an excellent quality of beets.

Vermont.

Only 8 samples of beets from Vermont were received at the Department of Agriculture, and these were of very high quality. The mean weight of the samples received was 22 ounces, the mean content of sugar in the beet 14.2 per cent, and the mean coefficient of purity, 84.1.

At the agricultural experiment station of Vermont 32 samples were received. The average weight of the beets received at the experiment station was 17 ounces, the mean percentage of sugar in the beet 16.3, and the mean purity 84.2. In reporting the results of the experiments the director of the station makes the following observations:

RESULTS OF EXPERIMENTS IN VERMONT.

One hundred persons guaranteed at the outset of the season to grow the crop and ship us samples. We had returns from twenty-seven. The remaining seventy-three, however, were not so much at fault as was the Weather Bureau. The weather throughout the State during the months of May, June, and July and the first part of August was execrable, there being several times the normal rainfall. In almost every case of not sending samples the report was that the crop was drowned out. It strikes me as somewhat doubtful whether the results obtained in the twenty-seven cases reported are truly representative of what might be expected under normal conditions of weather. The percentages of sugar certainly run quite high. I find that several of the growers sent their samples to Washington. I should be gratified, if it were possible, to receive the statement of the analyses, as we may wish to make some use of the sugar-beet data ourselves, which, as I understand, we are at liberty to do.

The majority of those who made a failure of the work this year expressed their desire to try again next year.

Of 32 beets analyzed at the agricultural experiment station of Vermont the number containing from 12 to 14 per cent of sugar was 2; the number containing from 12 to 14 per cent of sugar and weighing 16 ounces or over was 1; the number containing more than 14 per cent of sugar was 28; the number containing more than 14 per cent of sugar and weighing 16 ounces or more was 12.

It is seen from the above data that the only limitations upon the growing of beets in Vermont are the extent of the area suitable to the culture of the beets and the length of the growing season. It is evident, in so far as growth is concerned, that such a season as that of 1897 is capable of producing beets of the highest grade, but the growing season includes properly the season of harvest and preservation of the beets. The high northern latitude of Vermont and the early and severe winters must be taken into consideration in this particular. Vermont is also a mountainous country, and the areas of level land are not proportionately so great as in most of the States which have been considered for beet growing. Where bodies of from 15,000 to 25,000 acres of level and fertile land can be found with the autumnal conditions favorable for the harvest and preservation of the beets, there is no reason to doubt the possibility of successfully establishing the beet-sugar industry.

INFLUENCE OF TEMPERATURE ON THE QUALITY OF SUGAR BEETS.

The influence of temperature and other climatic conditions upon the growth of beets is discussed under the head of special experiments in growing beets from high-grade seeds. It will be interesting, however, to compare the deductions from that discussion with those from data

obtained from certain parts of the country where favorable conditions exist for making this comparison. The States of Ohio, Indiana, and Illinois are situated in a peculiarly favorable manner for a study of this kind. Each of these States has a portion of its area in the theoretical thermal belt and a large portion of its area outside of that belt. In each of these States, therefore, the data received from the various counties were classified into three portions, namely, the northern, the central, and the southern belts.

The following is a tabulation of the data from each one of these sections in the three States:

Relation of latitude to development of sugar content.

	Northern belt.			Central belt.			Southern belt.		
	Average weight of beets.	Sugar in beets.	Purity coefficient.	Average weight of beets.	Sugar in beets.	Purity coefficient.	Average weight of beets.	Sugar in beets.	Purity coefficient.
	Ounces.	*Per ct.*		*Ounces.*	*Per ct.*		*Ounces.*	*Per ct.*	
Ohio	29.4	13.6	79.4	32.6	13.2	78.0	35.0	12.2	75.3
Indiana	18.9	13.3	81.9	18.5	12.9	80.7	14.2	10.7	78.0
Illinois	22.0	13.2	79.3	20.0	11.5	75.4	19.0	11.1	74.7

The data in the above table have a peculiar value in establishing, by experimental results, the validity of the scheme employed in the construction of the theoretical thermal belt suitable to the growing of beets. In every one of the States mentioned there is a gradual deterioration in the quality of the beet, both as respects its sugar content and its purity, in passing from the northern to the southern belt of the State. It may be said that the difference between the two extreme areas is not very great, and that for this reason it would be advisable to establish factories indiscriminately in one or the other of the belts, according to more or less favorable local conditions, aside from the sugar content of the beet. The fallacy of this statement, however, will be evident to anyone who studies carefully the conditions of manufacture. An increase of 1 per cent in the sugar content of the beet means an increase of 20 pounds per ton in the amount of sugar manufactured, without any corresponding increase in the expense of manufacture. In other words, the cost of extracting the sugar from a ton of beets which would yield 180 pounds would be just as great as that attending a ton of beets which would yield 200 pounds of sugar. But the additional value of the 20 pounds of sugar manufactured might in many instances determine whether the business would be conducted at a profit or a loss. The above assumption is true on the supposition that the coefficient of purity remains the same in each case. When we consider in addition to the loss of the sugar, the depreciation in the purity of the juice, the discrepancy between the sections becomes all the greater. Not only is the loss attending the lower sugar content of the beet to be considered, but also the additional loss

which is coupled with the lower purity. In other words, a ton of beets with a coefficient of purity of 80, which would yield 200 pounds of sugar by the ordinary processes of manufacture, would yield very much less than this if the purity coefficient should fall to 76, and would yield very much more if it should rise to 85. The data obtained in the above table afford convincing proof of the fact that it is not safe to push the manufacture of beet sugar too far south of the theoretical thermal belt, unless the depreciation in the sugar content and purity of the beet is compensated for by some remarkable local factors, in the way of cheapness of manufacture, which will make good the loss due to the low content of sugar and the low purity of the juice. These figures, obtained in this miscellaneous way, are fully corroborated by the careful experimental data obtained in the culture of high-grade beets at the six stations which are mentioned in another place. From exactly the same seeds, planted in exactly the same way and cultivated in the same manner, exceptionally high-grade beets of fine sugar content and high purity were obtained from the New York station, good beets were grown at the Wisconsin station, fairly good beets at the Iowa station, beets with a fairly good content of sugar but diminutive in size on account of the drought at the Indiana station, beets of good size and very low content of sugar at the Kentucky station, beets of only minimum content of sugar and very small size at the Tennessee station. These results are such as should be studied carefully by intending investors who desire to place their money where the certainty of return is the greatest. With such magnificent areas open to cultivation as are found in the States of New York, northwestern Pennsylvania, northern Ohio, northern Indiana, and southern Michigan, it would not be wise for men of capital to select localities which the figures at hand indicate are less favorable to the production of high-grade beets. The data which have been obtained from New York and from Michigan indicate that with the best principles of culture, with good fertilization and skilled oversight, beets can be grown over wide areas fully equal in sugar-producing power to those which are grown by the skilled farmers of Germany. On the other hand, it is quite certain that if the area of culture be pushed to the south, so as to fall entirely without the limits of the thermal belt, the same fertility of soil, the same fertilization, and the same care in culture will produce beets less rich in sugar, with a lower purity, and yielding less sugar per ton than those grown in the localities first mentioned.

As to how far the successful growth of the sugar-beet industry can be pushed north of the limit of 69°, it may be said that the only condition to be considered in this matter is the possibility of producing and ripening a crop and harvesting it before the rigors of winter set in. The culture of the sugar beet may be very successfully practiced in localities where the mean summer temperature falls even as low as 64°,

provided the latitude is far enough north to get sufficient sunshine to mature the beets before the frosts of autumn. If the autumn be mild and merge gradually into winter, the limit of successful culture will be found where the freezing weather of winter cuts short the time required for the harvesting and siloing of the crop of beets. In the light of the data at present available, therefore, the southern limit of the sugar-beet belt may be regarded as the isotherm of 71° for the three summer months, occasionally pushing 50, 75, or even more miles south of this line, where exceptional conditions of soil and manufacturing facilities are presented. The facts of the case, however, warrant the statement that the safer plan will be not to push south of the isotherm of 71° so long as equally favorable conditions of soil and manufacture are obtainable north of this line of demarcation. It is deemed wise to dwell particularly upon this subject, because of the fact that so many people living south of the isotherm of 71° are vitally interested in this matter and so eager to have the industry established in the neighborhoods in which they live. The conclusions which have been drawn are not meant to discourage experimental work in areas widely remote from those mentioned. It is only just, however, to call attention to the fact that investments of large amounts of capital which result disastrously do more to deter the successful establishment of an industry than a much larger number of successful investments favor it. For instance, in the State of Wisconsin we have an illustration of the financial failure of an attempt to manufacture beet sugar, and as a result of this failure it will be difficult to induce capital to look for investment in Wisconsin in the sugar-beet industry, although the conditions in that State are exceedingly favorable to success. Had it not been for the failure of the factory projected at Menominee Falls, it is quite certain that other capital would be invested in the State at the present time, and instead of the industry being in a stagnant condition it would be advancing on the road toward success. It is extremely important that no mistakes be made from a financial point of view, and that every precaution to avoid these mistakes be observed. When subsequent experimentation shall have demonstrated that there are areas outside, and especially south of the theoretical belt, equally as well suited to the growth of beets sufficiently rich in sugar as those which have been mentioned, it will be time enough to ask capital to seek investment in those localities.

SUGAR BEETS AS CATTLE FOOD.

Thousands of farmers in various parts of the country are growing beets in an experimental way and have no opportunity to dispose of their product to sugar factories. These farmers may, nevertheless, find the growing of small quantities of sugar beets profitable by using the product for cattle food. Following is an analysis lately made in

this laboratory of a sample of sugar beets received from a locality such as is mentioned above:

Composition of fresh beet pulp.

	Fresh pulp.	Dry matter.
	Per cent.	*Per cent.*
Moisture	73.87	....
Fiber (crude)	1.53	5.89
Ash	1.35	5.18
Ether extract (fat)	.11	.42
Proteids	2.21	8.47
Sugar and other carbohydrates	20.93	80.04
	100.00	100.00

The sample in question contained 73.87 per cent of water and 26.13 per cent of dry matter. The analyses of hundreds of samples of beets in this laboratory show that the average content of fiber, usually called "marc," is about 5 per cent. In the process of analysis all this marc is dissolved except that which is entered above as crude fiber, namely, 1.53 per cent. The difference between this and the 5 per cent average content of marc, namely, 3.47 per cent, shows the quantity of carbohydrate matter not sugar contained in the 20.93 per cent of total sugars and carbohydrates. The quantity of sugar in the sample analyzed was, therefore, 17.46 per cent. Practically all, however, of the carbohydrates, except those represented by the crude fiber, are digestible, so that the soluble marc has practically the same food value as the sugar itself. The ratio of the proteid matter to the digestible carbohydrates plus fat multiplied by $2\frac{1}{4}$, is 9.59. This ratio shows that the food is particularly a fattening one, and could be used to great advantage in preparing fat stock for market. The analysis also indicates that the food, to secure the best results for all-round sustenance, should be fed with some highly nitrogenous ration in order to secure a smaller ratio between the two groups of nutrients. It may be said with perfect confidence that it will be far more profitable for the farmer to grow sugar beets at 12 tons per acre for cattle food than other root crops, such as turnips and ruta-bagas, which will yield double that quantity per acre. The food value of these crops does not depend upon the gross tonnage, but upon the actual nutrients which they contain. Sugar beets contain, as is seen, over 20 per cent of their weight of actual nutrients, while turnips and radishes may contain only from 6 to 12 per cent.

USE OF BEET PULPS FOR CATTLE FOOD.

The residue from beet factories, in the form of the beet pulp, is also a valuable cattle food. In this country no carefully controlled feeding experiments have been conducted with this material, but the question has been studied most thoroughly in Europe, and the data obtained can be used for our guidance. There is practically no difference in chemical composition between the beet pulps obtained in

Europe and in this country, so that the deductions to be drawn from the feeding experiments in that country can be applied with perfect safety to similar work here. At many of the factories in this country practical feeding tests have been made, and with favorable results. Having heard that successful experiments in feeding cattle and sheep had been conducted at the factory of the Pecos Valley Beet Sugar Company, I addressed a letter to the manager of that factory, and received the following reply:

EDDY, N. MEX., *February 21, 1898.*

DEAR SIR: I have your letter of the 14th. Shortly before the close of our campaign, Mr. A. J. Crawford, a large sheep owner of this section, looked into the question of feeding beet pulp to sheep, and finally decided to try a bunch of 500 lambs as an experiment. These lambs were the culls of his flock, and when brought to the feeding pens at the factory were in very poor condition. In a few days they took to the pulp very readily, and are now eating 7 to 10 pounds of pulp per day each, with sufficient hay (alfalfa) as roughening. They have picked up wonderfully during the time they have been here, and Mr. Crawford tells me that they are now the best looking of any he has. He is so well satisfied with the result of his experiment that about a week ago he brought in 2,000 ewes with the intention of feeding them on the pulp during the lambing season. You, of course, are aware that the pulp is a great milk producer, and by feeding it Mr. Crawford will be able to carry both ewes and lambs through in good shape until the grass comes, and, of course, thereby prevent the loss which he would otherwise have to stand of the many ewes and lambs which would die on the range.

When the lambing season is over and we see how the sheep come through I shall be glad to write you fully. Mr. Crawford is anxious to make a contract for all our next year's pulp, and I have no doubt that the feeding of sheep on pulp in this valley will become quite an industry.

Yours, truly,

A. S. GOETZ,
General Manager.

Mr. H. W. WILEY,
Division of Chemistry, Washington, D. C.

It is evident from the above that these practical experiments in feeding, although not controlled by actual chemical analyses, have been eminently successful, and it is not at all unlikely that within a few years our beet factories will be able to contract in advance for all the pulp which they can possibly produce. To illustrate more clearly the value of the pulp and its value for feeding purposes, the following extracts, taken from standard European authorities, are published:

DIFFUSION PULPS OR EXHAUSTED COSSETTES.

The following table contains an average of analyses made by Messrs. Vivien, Lucas, Duvin, Durot, and Dupont as a commission of experts in France:

	Fresh pulp.	Dry material.
	Per cent.	*Per cent.*
Moisture	89.09	....
Nitrogenous matter	.92	8.43
Digestible carbohydrates	6.52	59.76
Indigestible carbohydrates	1.98	18.15
Fat	.09	.83
Mineral matter	1.40	12.83
	100.00	100.00
Solid matter	10.91	....

FEEDING EXPERIMENTS WITH BEET PULP.

Extensive tests in feeding pulps have been made at the Francières sugar house of M. Gallois. The following animals were used: (1) Beef cattle, (2) oxen, (3) milch cows, (4) sheep, (5) ewes. Before beginning the tests, these animals were all gradually accustomed to the change from their customary ration to that of diffusion pulp.

(*a*) *Beef cattle.*—Twelve beeves each received every day, in three meals, 52.26 kilograms (115 lbs.) of diffusion pulps, mixed with 3 kilograms of linseed oil cake and 3 kilograms (6.6 lbs.) of chopped alfalfa. Their weight increased an average of 1.004 kilos (2.214 lbs.) per day. If we consider the value of the meat as 0.95 franc ($0.19), that of the oil cake 0.25 franc ($0.05), and that of the alfalfa 0.08 franc ($0.016) per kilogram (2.2 lbs.), we find that the feeding value of the diffusion pulp was 6.58 francs ($1.316) per 1,000 kilograms (2,205 lbs.).

(*b*) *Oxen.*—Four oxen each received the following ration per day: 57.5 kilograms (126.8 lbs.) of diffusion pulp mixed with 5 kilograms (12 lbs.) of alfalfa and 1 kilogram (2.2 lbs.) of linseed-oil cake. These cattle decreased somewhat in weight in the first fifteen days, and did less than the usual amount of work, but in the second fifteen days they had entirely recovered. The trial continued two and a half months. In making a calculation analagous to that above, the value of the diffusion pulp was 4.78 francs ($0.956) per 1,000 kilograms (2,205 lbs.).

(*c*) *Milch cows.*—The test with milch cows lasted thirty days. Two cows were employed—one Flemish and the other Dutch. Before the tests the cattle were fed on dry alfalfa with a small quantity of beet pulps produced by the hydraulic-press method. The cows were each given, per day, 45 kilograms (99.2 lbs.) of diffusion pulp with 2 kilograms (4.4 lbs.) of alfalfa. The tests demonstrated that the diffusion pulp is more advantageous as regards lactation than in the production of flesh.

Cows fed on diffusion pulps.

Date.	Cream per 100 cc. of milk.	
	Cow No. 1.	Cow No. 2.
April 27	8.00	7.00
May 1	7.50	8.00
May 12	7.50	8.00
May 19	7.50	8.00

From these tests it was shown that the milk of the cows fed from diffusion pulp contained an average of 7.68 per cent of cream. The butter produced from this milk did not have the peculiar disagreeable odor which is present in that from cows fed on press pulps.

(*d*) *Sheep.*—In this test twenty merino sheep were fed on diffusion pulp. The following table shows the result of this test and the rations fed per animal:

	Kilos.		
Weight:			
April 4	948	=2,085.6	pounds.
April 26	1,008	=2,217.6	pounds.
Total increase	60	= 132.0	pounds.
Increase per sheep per day	0.137	= .3	pounds.
Average rations per head:			
Pulp	5.4	= 11.88	pounds.
Linseed-oil cake	.2	= .44	pounds.
Chopped alfalfa	.5	= 1.10	pounds.

It was not necessary to make other additions to the diffusion pulp, since the sheep ate it with avidity. With the aid of these figures we may calculate the value of the pulp as follows:

The sheep gained per day 0.137 kilogram (.3 lb.) in meat, which at 1 franc ($0.20) per kilo (2.2 lbs.) equals 0.137 franc ($0.027). They consumed a ration, exclusive of the pulp, costing 0.09 franc, therefore the value of the 5.4 kilos (11.9 lbs.) of diffusion pulp was 0.047 ($0.01), or 8.70 francs ($1.74) per 1,000 kilograms (2,205 lbs.).

Experiments made with ewes.—The ewes were obtained from a flock from which the lambs had just been separated. In feeding the ewes, to which a somewhat larger ration was given, the value of the pulp was found to be 6.03 francs ($1.206) per 1,000 kilograms (2,205 lbs.). Taking all of these elements into account, the experts estimated definitely the value of 1,000 kilograms (2,205 lbs.) of diffusion pulp to be 5.55 francs ($1.11). They also demonstrated that diffusion pulps keep perfectly.

Not taking into account questions of transportation, etc., the value of diffusion pulp was estimated at 6.10 francs ($1.22) per 1,000 kilograms (2,205 lbs.). Basing a conclusion upon the chemical analysis of the pulp, a value of 6.44 francs ($1.288) was obtained, as compared with the 6.10 francs ($1.22) per 1,000 kilograms (2,205 lbs.) given by experiments.

EXPERIMENTS BY ANDOUARD AND DÉZAUNAI.

(Sucrerie Belge, Vol. 12, No. 7.)

In tests in feeding diffusion pulp to milch cows this pulp was given in a ration, first of 27 kilograms (59.5 lbs.) and later 55 kilograms (121.3 lbs.) per day, and produced immediately an increase of approximately 32 per cent in the yield of milk. It appeared, however, to be without influence on the richness of the milk in casein and mineral matter, but produced an increase in the yield of butter of 12.4 per cent, and in that of the sugar of 24.63 per cent over the previous proportions of these constituents. It, however, gave the milk a less agreeable taste and a

certain predisposition to an acid fermentation. The butter, therefore, would probably not be of excellent quality.

*Analyses of diffusion pulps before ensilage.**

Constituents.	Maercker.	Kühn.
	Per cent.	*Per cent.*
Water	89.77	88.9
Dry matter	10.23	11.1
Ash	.58	.9
Fat	.05	.1
Crude fiber	2.39	2.5
Crude protein	.89	.9
Nitrogen-free extract	6.32	6.7

*Diffusion pulps after having been stored in the silos.**

Constituents.	Maercker.	Kühn.
	Per cent.	*Per cent.*
Water	88.52	87.5
Dry matter	11.48	12.5
Ash	1.09	.9
Fat	.11	.1
Crude fiber	2.80	3.0
Crude protein	1.07	1.2
Nitrogen-free extract	6.41	7.3

* Sachs' Revue Universelle des Progrès de la Fabrication du Sucre, 1, 428.

Analysis of diffusion pulps, by Pellet.

Constituents.	Pressed pulp.	Dry material.
	Per cent.	*Per cent.*
Water	88.06	....
Nitrogenous matter	.84	7.04
Digestible carbohydrates	7.30	61.14
Indigestible carbohydrates	2.46	20.60
Fat	.06	.50
Soluble mineral matter	.43	3.60
Insoluble mineral matter	.85	7.12
	100.00	100.00
Dry matter	11.94	....

Maercker (Sucrerie Belge, vol. 11, page 464) determined that siloed pulps, in addition to losing water, also lost a considerable portion of their dry matter. This is shown in the following statement of the analysis of pulps which were siloed for five months, in which time they lost the following percentages:

Thirty-seven and eight-tenths of nitrogen free extract, 25.5 of nitrogenous matter and 29.6 of the fiber which they contained: The pulps gained, on the contrary, in fat, owing to the lactic and butyric fermentations. The losses were due to decomposition, and not to entrainment in the moisture lost.

*Analyses of diffusion pulp, by Vivien.**

Constituents.	Pressed pulp.	Dry material
	Per cent.	*Per cent*
Digestible proteids (nitrogen X 6.25)	0.64	7.73
Indigestible proteids (amid nitrogen X 9)	.04	.48
Nitrate of potassium	.05	.60
Digestible carbohydrates	4.07	49.15
Cellulose and indigestible carbohydrates	1.92	23.19
Fat	.05	.60
Sugar	.54	6.52
Assimilable mineral matter	.35	4.23
Indigestible mineral matter	.61	7.37
Water	91.72	....
	100.00	100.00

*Analyses of diffusion pulp, by Pellet.**

Constituents.	Pressed pulp.	Dry material.
	Per cent.	*Per cent.*
Water	88.88	....
Organic matter	9.95	89.50
Soluble inorganic matter	.57	5.13
Insoluble inorganic matter	.60	5.40
	100.00	100.00
Acidity (expressed as acetic acid)	1.01	9.08
Total nitrogen	.147	1.32
Insoluble nitrogen (at the boiling point of water)	.111	....

* Sachs' Revue Universelle des Progrès de la Fabrication du sucre, 1, 429.

The pulps diminished in weight in the silos, the diffusion pulps losing 6 per cent per month. At the same time there was a diminution in the weight of the dry matter, approximately 1 per cent of the diffusion pulp.

It is evident from the above data that the value of the pulp from beet-sugar factories, especially in thickly settled countries and in those regions where the dairy interests are prominent, will prove of no inconsiderable advantage in the successful introduction of the beet sugar industry and its rapid advancement. Beet pulps form a wholesome and nutritious, though a somewhat poorly balanced ration. Their chief nutriment is found in the carbohydrates, composing the marc of the beet and including the unextracted sugar, and in the proteid nitrogenous matters, and a large percentage of these is easily digested. While beet pulp is not suitable for the entire food of the animal, it can be made a principal part thereof, varying its proportions with the nature of the effect desired to be produced. Experience has shown that it is especially relished by dairy cattle, produces an abundant supply of milk, and where properly preserved and fed, it can be used in great abundance without imparting to the milk, butter, or cheese any unpleasant flavor.

SUMMARY OF DATA COLLECTED IN PREVIOUS YEARS.

In order to present data covering as wide a field as possible, and including the experiments of several seasons, the following table has

been compiled from the reports of the Division of Chemistry and from the bulletins of the various State experiment stations:

Analyses of sugar beets grown in various States.

[A compilation of the analytical data obtained at the various State experiment stations for the years 1888 to 1897, inclusive, and at the United States Department of Agriculture for the years 1884 to 1897, inclusive.]

State.	Year.	Analyses by the United States Department of Agriculture.				Analyses by the State experiment stations.			
		Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.
			Ounces.	Per ct.			Ounces.	Per ct.	
Alabama	1893			5.9	66.7				
Arizona	1891	2	51	7.7	56.9				
	1897	7	23	9.3	70.4	157		*a* 8.1	61.8
Average		9	29	9.0	67.4	157		8.1	61.8
Arkansas	1891	2	40	6.4	58.8				
	1892	3	12	9.4	64.7				
	1897	2	18	11.3	71.5				
Average		7	22	9.1	65.0				
California	1884	71	19	13.7	85.3				
	1888					5		10.7	
	1889					14	19	12.1	77.7
	1890	4	13	14.7	84.6	18	17	10.7	73.0
	1891	8	48	11.1	75.8			*b* 13.0	
	1892	4	14	14.7	77.6			*b* 14.0	
	1893							*b* 14.0	
	1894							*b* 15.0	
	1895							*b* 15.0	
	1896							*b* 14.0	
	1897	1	26	16.8					
Average		88	21	13.6	85.3	37	18	11.2	75.1
Colorado	1888							9.9	
	1889					37		10.2	
	1890	29	20	12.5	76.1	73	25	11.0	83.0
	1891	51	26	13.1	76.1	4		*13.5	79.3
	1892	170	18	14.8	81.7	16		*13.8	80.6
	1893	18	17	13.2	74.9				
	1897	174	20	13.6	76.7	12		14.3	79.7
Average		442	20	13.9	78.4	142	25	11.5	82.1
Connecticut	1890	2	14	9.7	76.1				
	1891	5	27	10.8	77.3				
Average		7	23	10.5	77.0				
Georgia	1891	2	12	11.1	64.9				
Idaho	1890	1	4	8.0	68.3				
	1891	1	15	12.7	74.9				
	1892	2	34	14.7	79.1				
	1893	2	78	10.2	76.2				
	1894					192		13.7	76.1
	1895					342		15.2	79.9
	1896					60		14.2	77.3
	1897	7	21	15.5	79.4	41		15.2	87.6
Average		13	30	13.8	77.6	635		14.6	80.2

* The sign * indicates that the number given is 0.95× per cent of sugar reported since it was doubtful whether the per cent of sugar was expressed in terms of the weight of the juice or that of the beet, though probably the former.

a Analyses of Kleinwanzlebener only show: 32 samples, sugar 11.8, purity 73.6.

b From report made on the total crop by the Chino Valley Beet Sugar Company.

Analyses of sugar beets grown in various States—Continued.

State.	Analyses by the United States Department of Agriculture.					Analyses by the State experiment stations.			
	Year.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.
			Ounces.	*Per ct*			*Ounces.*	*Per ct.*	
Illinois	1890	8	31	10.3	72.1	......	......	......	......
	1891	36	32	11.7	76.4	......	......	......	......
	1892	59	15	10.9	75.2	......	......	......	......
	1897	32	17	13.1	75.5	312	20	11.9	76.4
Average	......	135	21	11.6	75.4	312	20	11.9	76.4
Indiana	1888	......	......	......	......	5	......	12.2	......
	1889	......	......	......	......	10	......	11.9	......
	1890	56	23	10.7	72.7	26	7	9.1	......
	1891	77	27	11.6	76.9	131	*a* 20	12.0	78.8
	1892	57	14	11.2	72.5	95	12	11.1	76.8
	1893	4	10	10.7	73.1	49	12	11.8	79.3
	1894	......	......	......	......	84	25	11.8	78.8
	1897	103	14	13.1	78.9	205	18	12.0	80.7
Average	......	297	19	11.9	75.9	605	17	11.7	79.2
Indian Territory	1891	1	27	11.6	76.9	......	......	......	......
Iowa	1888	......	......	......	......	4	17	11.9	76.5
	1889	......	......	......	......	12	34	9.9	64.9
	1890	30	22	11.8	74.5	34	33	10.7	71.4
	1891	321	30	11.8	75.7	503	16	12.1	74.0
	1892	30	24	10.9	76.2	404	21	11.6	72.9
	1893	7	17	12.8	75.8	563	19	11.9	76.1
	1894	......	......	......	......	150	19	11.5	74.9
	1897	130	18	13.3	73.7	642	19	12.4	76.6
Average	......	518	26	12.1	75.2	2,312	19	12.0	75.0
Kansas	1889	......	......	......	......	7	......	8.9	69.7
	1890	22	32	8.3	69.3	16	31	7.9	......
	1891	36	33	10.7	68.2	183	19	9.6	70.6
	1892	22	25	11.1	74.2	115	21	10.2	73.4
	1893	1	......	14.3	72.8	22	21	10.1	71.8
	1897	41	27	11.4	73.8	158	17	11.9	77.0
Average	......	122	29	10.6	71.4	501	19	10.4	73.4
Kentucky	1891	3	34	9.1	63.7	......	......	......	......
	1892	4	13	8.9	77.2	......	......	......	......
	1897	6	16	11.9	71.5	......	......	......	......
Average	......	13	19	10.3	72.2	......	......	......	......
Louisiana	1893	3	12	8.9	68.3	......	......	......	......
Maryland	1890	83	15	12.2	79.3	5	10	12.2	79.7
	1891	2	16	7.4	68.5	......	......	......	......
	1897	29	19	11.4	79.1	......	......	......	......
Average	......	114	16	11.9	79.1	5	10	12.2	79.7
Massachusetts	1889	......	......	......	......	10	......	12.2	......
	1890	6	16	12.0	82.8	6	17	13.4	*b* 77.1
	1891	......	......	......	......	6	17	13.4	78.1
Average	......	6	16	12.0	82.8	22	17	12.8	77.6
Michigan	1889	......	......	......	......	6	*c* 19	12.6	......
	1890	30	31	12.0	78.4	......	......	......	......
	1891	50	32	12.6	78.0	229	......	13.3	86.2
	1892	71	19	14.1	83.4	......	......	......	......
	1893	88	15	13.3	82.1	......	......	......	......
	1897	450	22	14.7	81.1	465	27	16 4	84.0
Average	......	689	22	14.2	81.1	700	27	15.5	84.7

a Average weight of 71 samples. *b* Purity of but 1 sample.
c Average weight of 2 samples.

Analyses of sugar beets grown in various States—Continued.

State.	Year.	Analyses by the United States Department of Agriculture.				Analyses by the State experiment stations.			
		Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.
			Ounces.	*Per ct.*			*Ounces.*	*Per ct.*	
Minnesota	1890	107	30	11.8	75.2	55	....	*12.3	76.5
	1891	41	29	12.4	75.7	467	*a*23	*13.0	79.7
	1892	22	29	12.2	78.1	180	17	14.3	85.5
	1893	7	60	10.8	70.8	....	....	....	....
	1897	49	24	11.0	79.2	143	17	13.1	81.8
Average	......	226	29	11.7	76.3	845	19	13.2	81.1
Missouri	1890	2	21	8.4	66.7	5	17	13.4	....
	1891	67	20	10.4	62.4	59	28	9.3	67.3
	1892	13	33	8.1	63.4	....	....	....	....
	1897	324	20	11.7	73.5	304	26	10.6	71.0
Average	......	406	20	11.4	71.6	368	26	10.4	70.4
Montana	1891	35	25	13.2	76.8	....	....	....	....
	1892	6	22	10.9	72.8	....	....	....	....
	1893	2	15	14.3	75.0	....	....	....	....
	1897	4	20	14.4	77.8	70	23	14.7	77.0
Average	......	47	24	13.1	76.3	70	23	14.7	77.0
Nebraska	1888	....	....	....	....	9	....	12.7	....
	1889	....	....	....	....	159	46	10.3	54.5
	1890	269	20	11.8	71.9	462	17	*12.3	73.9
	1891	62	35	11.7	75.3	218	*b*23	12.8	77.9
	1892	27	21	14.2	79.3	98	17	9.8	72.4
	1893	8	17	10.1	69.7	(*c*)	....	11.3	77.0
	1895	....	....	....	....	637	....	12.1	76.9
	1897	13	29	12.9	76.9	106	....	11.7	75.0
Average	......	379	23	12.0	73.1	1,689	22	11.9	73.7
Nevada	1891	18	11	17.2	88.0	222	25	12.5	76.9
	1892	81	13	15.9	83.4	221	18	14.8	80.8
	1893	....	....	....	....	51	20	13.6	80.8
	1894	....	....	....	....	....	....	....	....
	1895	....	....	....	....	176	....	13.1	*d*77.8
	1896	....	....	....	....	....	....	....	....
	1897	21	18	18.3	81.4	10	19	18.9	....
Average	......	120	14	16.5	83.7	680	21	13.6	78.7
New Hampshire	1891	1	19	11.6	80.0	....	....	....	....
New Jersey	1891	1	17	7.3	70.8	....	....	....	....
	1893	....	....	....	....	8	....	11.7	76.2
	1897	31	16	14.2	81.4	....	....	....	....
Average	......	32	16	14.0	81.1	8	....	11.7	76.2
New Mexico	1891	17	28	13.8	74.8	....	....	....	....
	1892	29	19	15.3	83.2	3	....	*17.0	....
	1897	3	13	17.2	82.0	219	26	13.2	....
Average	......	49	22	14.9	80.2	222	26	13.3	....

* The sign * indicates that the number given is 0.95× per cent of sugar reported since it was doubtful whether the per cent of sugar was expressed in terms of the weight of the juice or that of the beet, though probably the former.

a Average weight of 229 samples.

b Average weight of 88 samples.

c Analyses reported by the Standard Cattle Company.

d Averages for 1893 to 1896, inclusive.

Analyses of sugar beets grown in various States—Continued.

State.	Analyses by the United States Department of Agriculture.					Analyses by the State experiment stations.			
	Year.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.
			Ounces.	*Per ct.*			*Ounces.*	*Per ct.*	
New York	1889	......	......	......	......	6	......	9.9	......
	1890	10	15	12.1	78.0	......	......	......	......
	1891	4	32	11.6	76.8	......	......	......	......
	1892	8	22	15.4	85.9	......	......	......	......
	1893	......	......	......	......	29	38	12.9	......
	1897	225	21	15.0	82.4	562	*a*16	15.9	83.2
Average	......	247	21	14.8	82.2	591	20	15.7	83.2
North Carolina	1892	4	4	9.0	73.4	......	......	......	......
	1893	......	......	4.1	52.1	......	......	......	......
	1897	7	23	9.1	75.3	......	......	......	......
Average	......	11	16	9.1	74.6	......	......	......	......
North Dakota	1890	24	25	13.4	71.2	9	......	13.8	......
	1891	11	23	11.8	73.2	129	29	10.9	73.9
	1892	11	24	12.9	76.5	......	......	......	......
	1893	2	27	14.0	80.7	......	......	......	......
	1897	4	28	10.5	81.2	......	......	......	......
Average	......	52	25	12.8	73.9	138	29	11.1	73.9
Ohio	1890	15	26	9.8	76.0	......	......	......	......
	1891	66	31	11.3	73.5	24	......	9.8	......
	1892	102	17	14.2	80.2	......	......	......	......
	1897	68	22	13.8	79.1	554	31	13.3	78.7
Average	......	251	23	13.1	77.9	578	31	13.2	78.7
Oklahoma	1891	1	48	6.4	53.3	......	......	......	......
	1897	1	10	11.8	72.5	21	......	11.4	65.3
Average	......	2	29	9.1	62.9	21	......	11.4	65.3
Oregon	1890	2	20	15.1	73.4	37	*b*26	11.2	......
	1891	35	34	12.7	81.1	98	22	12.6	78.4
	1892	12	19	14.2	80.2	65	27	14.4	82.7
	1893	......	......	......	......	......	......	......	......
	1894	......	......	......	......	......	......	......	......
	1895	......	......	......	......	23	......	14.3	*c*89.8
	1896	......	......	......	......	......	......	......	......
Average	......	49	30	13.2	80.6	223	24	13.1	81.3
Pennsylvania	1890	10	27	8.0	73.8	......	......	......	......
	1891	7	22	13.3	78.7	......	......	......	......
	1892	8	13	10.8	75.8	......	......	......	......
	1893	1	......	11.0	78.9	......	......	......	......
	1897	59	18	13.8	79.5	......	......	......	......
Average	......	85	19	12.8	78.4	......	......	......	......
Rhode Island	1897	2	21	11.9	74.2	......	......	......	......
South Carolina	1892	......	......	......	......	3	19	5.8	54.7
	1893	......	......	......	......	15	15	4.9	......
	1894	......	......	......	......	71	23	5.9	......
	1897	13	17	9.9	79.9	......	......	......	......
Average	......	13	17	9.9	79.9	89	22	5.7	54.7

a Average weight of 137 samples. *b* Average weight of 2 samples.
c Averages for 1893 to 1896, inclusive.

Analyses of sugar beets grown in various States—Continued.

State.	Year.	Analyses by the United States Department of Agriculture.				Analyses by the State experiment stations.			
		Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.
			Ounces.	*Per ct.*			*Ounces.*	*Per ct.*	
South Dakota	1889	....	....	....	....	17	....	9.1	....
	1890	21	20	13.1	78.6	58	....	14.2	74.7
	1891	202	22	12.5	75.3	1,264	25	11.9	73.3
	1892	67	20	13.1	75.5	680	19	14.2	80.7
	1897	5	17	15.1	83.2	337	14	15.5	85.6
Average	......	295	21	12.7	75.7	2,356	22	13.1	77.3
Tennessee	1891	5	20	8.8	65.8	....	....	....	....
	1892	1	10	9.4	72.4	....	....	....	....
	1894	....	....	....	....	22	22	9.5	75.1
	1897	17	11	10.8	71.9	8	4	12.0	....
Average	......	23	13	10.3	70.6	30	17	10.2	75.1
Texas	1890	2	38	10.0	69.3	....	....	....	....
	1891	10	23	10.3	69.1	....	....	....	....
	1897	11	22	12.6	76.5	14	34	8.0	56.3
Average	......	23	24	11.4	72.7	14	34	8.0	56.3
Utah	1890	....	....	....	....	21	....	15.3	86.1
	1891	....	....	....	....		....	*a*11.0	80.0
	1892	....	....	....	....	43	27	*12.5	82.2
	1893	....	....	....	....		....	*a*11.6	79.5
	1894	....	....	....	....		....	*a*12.7	80.2
	1895	....	....	....	....		....	*a*13.5	81.5
	1896	....	....	....	....		....	*a*13.9	81.8
	1897	35	20	14.3	81.1	....	....	....	....
Average	......	35	20	14.3	81.1	64	27	13.4	83.5
Vermont	1897	8	22	14.2	84.1	32	17	16.3	84.2
Virginia	1890	20	15	10.8	74.0	....	....	....	....
	1891	72	21	11.1	76.0	....	....	....	....
	1892	13	12	12.0	79.6	....	....	....	....
	1893	14	16	13.3	83.9	....	....	....	....
	1897	34	21	11.6	76.2	5	*b*21	11.6	....
Average	......	153	19	11.4	76.8	5	21	11.6	....
Washington	1890	1	16	15.2	84.2	....	....	....	....
	1891	11	18	14.5	83.9	....	....	....	....
	1892	31	18	14.5	76.8	....	....	....	....
	1893	183	28	12.3	74.0	....	....	....	....
	1894	....	....	....	....	1,666	25	*13.5	82.6
	1895	....	....	....	....	521	17	16.2	87.9
	1896	....	....	....	....	211	6	13.4	80.9
	1897	34	27	13.7	80.7	60	23	13.6	75.7
Average	......	260	26	12.8	75.7	2,458	22	14.1	83.4
West Virginia	1892	12	14	11.3	68.5	....	....	....	....
	1897	14	19	15.4	80.4	....	....	....	....
Average	......	26	17	13.5	74.9	....	....	....	....

* The sign * indicates that the number given is 0.95× per cent of sugar reported since it was doubtful whether the per cent of sugar was expressed in terms of the weight of the juice or that of the beet, though probably the former.

a Report made on total crop by Utah Sugar Company, 1891–1896.

b Average weight (net) estimated from average gross weight.

Analyses of sugar beets grown in various States—Continued.

State.	Analyses by the United States Department of Agriculture.					Analyses by the State experiment stations.			
	Year	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.	Number of samples.	Average weight.	Sugar in beet.	Purity coefficient.
			Ounces.	*Per ct.*			*Ounces.*	*Per ct.*	
Wisconsin	1890	10	21	12.8	81.3	94	35	11.7	76.3
	1891	432	26	11.1	75.8	373	32	11.9	76.2
	1892	21	22	12.7	77.8	61	26	15.2	81.6
	1897	42	15	15.8	83.3	1,663	....	12.1	74.1
Average	......	505	25	11.4	76.6	2,191	32	12.1	74.7
Wyoming	1890	5	26	15.1	78.8	....	....	....	....
	1891	18	12	13.5	78.1	55	11	15.4	77.8
	1892	6	8	15.2	85.2	71	14	15.9	78.7
	1893	48	19	15.9	80.5	33	....	16.2	80.9
	1897	34	19	17.2	82.3	....	....	....	....
Average	......	111	18	15.8	80.8	159	13	15.8	78.8

NOTES ON PRECEDING TABLE.

In a few instances analyses reported to the stations by sugar companies or organizations designed for the promotion of the sugar industry have been included. It is noticeable that in many States but few analyses have been made. In view of this fact, it is well to be cautious in accepting the results of these few analyses as being representative of the beets grown in the State.

The reports from the State of California are especially incomplete. Most of the analyses reported are from data obtained in the laboratory of the Chino Valley Beet Sugar Company. In view of the fact that California has several very large and very successful factories, we do not regard the data included here of great value in judging of the State as a producer of high-grade sugar beets. We have data of factory averages obtained in California representing in some cases more than 100,000 tons of beets, showing that the State produces beets of very high sugar content. Factory averages have been reported this year higher than 15 per cent of sugar in the beets. It will be noticed that in most instances the results obtained by the Department of Agriculture corroborate those obtained in the stations.

A notable exception to this is in the tabulation of the results obtained with beets grown in the State of Washington. The Department of Agriculture, however, has only made about one-tenth as many analyses of Washington beets as the station. The average of the results of the large number of Washington beets analyzed shows that this State is destined to be a large producer of sugar.

In many cases the averages are based on very incomplete data, and therefore must not be considered strictly representative of all the results included. In figuring the general averages each annual average is weighted in proportion to the number of samples it represents.

INVESTIGATIONS IN SEED PRODUCTION.

The second line of experiments carried on by the Department of Agriculture during the season of 1897 was devoted especially to the culture of high-grade beets in cooperation with a few of the agricultural experiment stations. The localities selected for the experiments were such as would represent as wide a range as possible of climatic conditions, and be compatible with the time at the disposal of the Chemist of the Department for doing the work, and with the quantity of high-grade seeds on hand. It was not deemed advisable to go into the arid regions with these experiments, because it was not possible, in the short time at our disposal, to make proper preparations for the conduct of our work. Under authority of the Secretary of Agriculture the Chemist of the Department made arrangements with the following experiment stations to conduct the work under as nearly as possible identical conditions, except those pertaining to climate:

The agricultural experiment station of New York, at Geneva.
The agricultural experiment station of Indiana, at Lafayette.
The agricultural experiment station of Wisconsin, at Madison.
The agricultural experiment station of Iowa, at Ames.
The agricultural experiment station of Kentucky, at Lexington.
The agricultural experiment station of Tennessee, at Knoxville.

In order that the experiments might be conducted on plots of equal area, each director of the stations mentioned above was furnished with

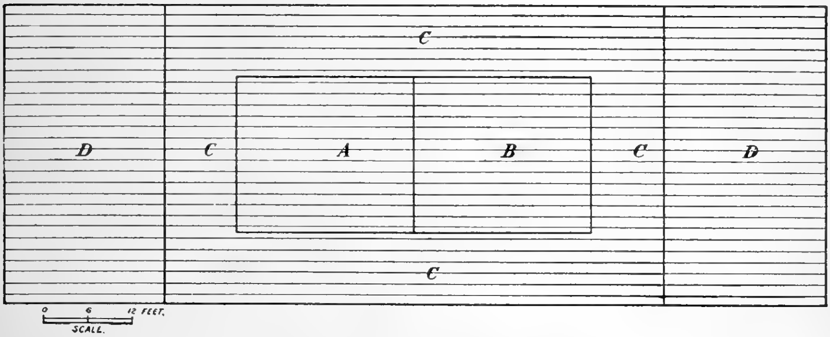

FIG. 2—Plot for guidance in planting sugar beets.

a diagram showing the manner in which it was thought most advisable to plant the different varieties of seeds. The diagram shown in figure 2 was accompanied by the following descriptive letter:

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF CHEMISTRY,
Washington, D. C., April 23, 1897.

DEAR SIR: For the sake of having complete uniformity in the comparative tests of high-grade beet seeds, I send herewith a diagram for the purpose of guiding you in the preparation of the plots and in the planting of the seed. The object of this diagram is to secure the planting of the high-grade seed in the interior smaller plots AB, each one of which has almost exactly the area of 500 square feet. If preferred the

size of the interior plots may be varied so as to make each of them exactly one one-hundredth of an acre, namely, 435.6 square feet. I think it would be better, however, to keep the interior plots AB each 500 square feet, as they fit the rows as indicated by the horizontal line, allowing exactly 14 rows in the plots, of a total length, including both interior plots, of about 47.6 feet. The interior plots AB are surrounded by a border CCCC, which is to be planted with the high-grade commercial seeds which I shall send you. The end plots DD are to be planted with the same kind of high-grade commercial seeds as CCCC, but these end plots are not necessary to the success of the experiments. The object of the border CCCC is to surround the high-grade seeds AA with beets grown under the same conditions, so that the exterior rows of the plots AA may be subjected to the normal conditions of beet growth, which would not be the case if such small plots were left unprotected. The scale of these plots is 1 inch=12 feet. I think it is important that the soil of the plots be prepared in accordance with the directions contained in Bulletin No. 52, a copy of which I transmit herewith. The plowing and subsoiling should loosen the ground to a depth of not less than 16, and, better, to a depth of 18 inches, and the surface of the soil, after plowing and subsoiling, should be reduced to perfect tilth.

I am now awaiting the remainder of the high-grade seeds, which I expect in a few days. There will be two varieties of the high-grade seeds, one to be planted in Plot A and the other in Plot B. All the seeds sent you will be plainly marked, so that no mistake can be made. The quantity of seed required for plots A and B will be about 5 ounces. I think it best that the interior plots A and B at least should be planted by hand. The number of seeds in the 5 ounces being known, they should be planted in groups at intervals of 9 inches; that is, in such a way as to secure one good, vigorous plant at about every 9 inches in the row after thinning. Five ounces of seed will contain approximately 5,000 seeds, and in the two plots A and B there will be 888 hills, which gives approximately nearly 6 seeds to a hill. In this case the planting would be accomplished as follows: Six seeds placed in the row at distances of 1 inch apart followed by an interval of 3 inches, then again 6 seeds at intervals of 1 inch, and so on. This grouping is shown in the following line:

9 in. 9 in.

. . .   .

Of course the spacing will vary according to the number of seeds to be planted.

If there be anything in connection with the diagram that you do not understand please let me know.

Respectfully, H. W. WILEY, *Chief of Division.*

The high-grade seeds furnished for planting the above plots were as follows:

(1) The Vilmorin Improved, grown at the experiment station of the United States Department of Agriculture at Schuyler, Nebr., in 1893. This station was abolished in the autumn of that year by Secretary Morton, and the principal part of all the high-grade seeds on hand was sold to the Oxnard Beet Sugar Company, of Grand Island, Nebr. A small portion of each variety was retained, however, in the hope that at some day the experiments might be reestablished. When subjected to a germination test, however, of all the varieties which had been preserved, only the Vilmorin Improved showed unimpaired vitality. All the other varieties grown at Schuyler showed a vitality too low to warrant planting.

(2) Original Kleinwanzlebener, grown by Kühn & Co., Naarden, near Amsterdam, Holland. These seeds were from specially analyzed mothers, showing the very highest qualities for seed production.

(3) High-grade commercial seed, grown by F. Demesmay, Cysoing, France. These seeds were not grown from specially analyzed mothers, but represented the high-grade commercial seeds produced at that place.

These three varieties were furnished for planting in Section B. There were also sent at the same time some of the high-grade commercial Kleinwanzlebener and Vilmorin's La Plus Riche for planting sections CCCC and DD, as indicated in the diagram. These seeds were sent to the various stations specified above on the 24th of April, 1897. The high-grade seeds which were to be used in planting Section A had not yet been received, and were not forwarded at that time.

The seeds ordered from Europe did not arrive until May 15, and were sent at once to the several stations on that day. In addition, seeds were received from August Rölker & Sons, representing Dippe Brothers, at New York, and from Martin Grashoff, of Quedlinburg. These seeds were also sent for planting the margins of the plot indicated above.

In the general instructions given to the directors of the stations it will be noticed that all the details of the work were left to be decided by them at the proper time, as any directions for time of planting, etc., would be but futile. Each one of the directors undertook to do the work strictly in accordance with the instructions provided in so far as the preparation of the land, planting, cultivation, and harvesting of the samples were concerned. The Chemist of the Department visited three of the stations during the season and conferred personally with the directors in regard to the progress of their work. The other directors were communicated with only by letter.

In the analytical work samples were selected according to instructions and sent to the Department of Agriculture, and others were analyzed in the laboratories of the collaborating experiment stations.

On May 6, the high-grade seeds not yet having arrived from Europe, I sent to each of the stations for planting Section A some high-grade seeds grown by Martin Grashoff, of Quedlinburg, obtained from Mr. Jellinek, an agent of the grower in this country. I suggested that Section A be planted with this seed, and then if the other seed expected from Germany came in time the plants could be dug out and the section replanted. The name of the seeds sent for planting Section A was White Improved Imperial Elite, which were produced by a cross of another variety with the Kleinwanzlebener. Directions for planting the seeds according to the plot were furnished each director.

The additional quantity of high-grade sugar-beet seed ordered from Dippe Brothers, Quedlinburg, Germany, was received and distributed to the stations on the 17th of May. In most cases the beets in Section A which were previously planted were not dug out, but the new seeds were planted in other localities.

The conditions of growth varied greatly in the different localities during the season. At the New York station the spring was backward and cold, and the planting and first development of the beets were

delayed. The subsequent conditions were favorable to good growth. The beets received no backset, and reached a fair maturity by the 1st of October. The autumn was mild and cool, and dry enough to prevent second growth, so that the beets could be left in the ground with perfect security until late in November.

At the Indiana station less favorable conditions obtained. A poor stand of the beets was secured in many instances where a perfect stand was secured at the New York station. The early leaves were badly eaten by an insect, and this prevented the early rapid development of the plant. Subsequently a period of extreme drought set in, lasting for nearly two months—during July and August. The result of all these unfavorable conditions was practically a complete failure of the crop, so that even in the case of the beets which were secured there were evidences of arrested development. The general result of the experiment was exceedingly discouraging.

At the Wisconsin station the field which was selected for the growth of the beets was not particularly well suited to the purpose. It had not been under previous cultivation for many years, and a portion of it, as is seen in the report of the director, suffered severely from various causes. The special plots which were cultivated in the high-grade seeds gave fairly good results, as will be seen farther on, and the beets produced were of good size, fair shape, and fine quality.

At the Iowa station fairly good seasonal conditions prevailed, and the character of the beets produced on the specially prepared plots was satisfactory.

At the Kentucky station the beets obtained a good start, and grew well for the greater part of the season. They were slightly retarded by dry weather at one period of their growth, but on the whole reached a fair stage of maturity without untoward accidents. The beets which were harvested in September and October showed a higher content of sugar than those that were left later in the ground, and this is probably due to the second growth, which was produced by the warm climate of that locality. The sugar content was exceedingly low, and the data secured from the station show conclusively that Kentucky is not in the list of possibilities as a sugar-producing State in so far as beets are concerned.

The data from Tennessee are extremely meager, and no definite conclusions can be drawn from those at hand.

In the study of the data received, it will be convenient to begin with the most southern station, namely, Tennessee, and then continue with the Kentucky, Indiana, Iowa, Wisconsin, and New York stations in the order named.

Tennessee.

The results obtained at the Tennessee station were extremely unsatisfactory. On account of the poor quality of the beets, only one sample was sent for analysis, which was harvested on the 25th of September. These beets were so small as to hardly deserve the name, and no attempt

was made to determine the purity of the juice. It is evident, from an inspection of the table which follows, that there was nothing in the result of the experiment to justify a further examination of the beets produced.

The cause of failure in Tennessee has been reported by the secretary of the station in the letter given below, and therefore no further explanation need be made here of the failure to attain even fairly satisfactory results.

THE AGRICULTURAL EXPERIMENT STATION
OF THE UNIVERSITY OF TENNESSEE,
Knoxville, February 15, 1897.

DEAR SIR: A reference to plat sent you May 26, 1897, will explain the following: Sugar beets grown from seed sown May 19, 20, 1897, were lifted when properly ripe, tops removed and put into separate piles on the ground close by, and covered with earth. In this condition the various lots remained until taken up to be weighed on 13th of this month. Roots found in good order, and are now being fed to our cows. The weights of the several lots were as follows:

Plat.	Variety and from whence received.	Area.	Weight.
		Sq. ft.	*Pounds.*
Subdivision N	Vilmorin's Improved White, from P. Henderson & Co., New York.	880	175
Subdivision J	Kleinwanzlebener Elite, Dippe Brothers, from Department.	589	54
Subdivision D	Vilmorin's, la plus rich, from Department	1,568	280
Subdivision C	High grade Kleinwanzlebener, from Department	1,642	369
Subdivision A	Memte Ober Wurst, Quedlinburg, Dippe Brothers, from Department.	448	64.5
Subdivision B (2 rows).	Original Kleinwanzelebener (Holland), from Department.	64	16.5
Subdivision B (3 rows).	Vilmorin's Improved (Schuyler, Nebr.), from Department.	96	12
Subdivision B (9 rows).	Demesmay, from Department	288	56
Subdivision E (triangle).	White Improved Imperial Elite (Grashoff), from Department.	224	124.5
		5,796	1,115.5

8,715 pounds per acre.

A miserably poor yield.—Soil prepared in best manner; germination good; when first leaves were formed an excellent stand. A few days after an incursion of flea beetles destroyed almost every plant in an irregular strip across the whole plat; this was done between the hours of 11 a. m. and 3 p. m., in one day. Cultivation was well and thoroughly done, but the planting was much too late. A plat of Vilmorin's Improved White grown near the farm building, the seed for which was planted April 1, gave us a very heavy yield. These were planted for table use and for stock feeding, and were purposely grown to make feed stuff, not for sugar.

Very respectfully, yours,

CHAS. F. VANDERFORD,
Secretary.

DR. H. W. WILEY,
Chief Division of Chemistry, U. S. Department of Agriculture,
Washington, D. C.

The details of the analytical data are found in the accompanying table of data.

KENTUCKY.

Special care was taken by the director of the station at Lexington to secure satisfactory results. During the early part of the season the beets grew exceptionally well and presented a fine appearance. The

quantity produced was fairly good, although the beets were somewhat irregular in size, some of them being quite large and others quite small. The sugar content of the beets and the purity of the juice were both extremely low. The first series of samples was analyzed on the 28th of September, and a second set of samples from two of the varieties was analyzed at a later date. The original Kleinwanzlebener (Holland) seed was represented by thirty-seven beets in this second sample, the average size of which was small and the sugar content medium. The White Improved Imperial Elite was represented in the second sample by forty-eight beets, also extremely small, and with a low content of sugar. The final harvest of the beets resulted in securing three barrels of beets of fine size and shape, but when these beets were perforated for analysis it was found that the content of sugar was low, falling, in some cases, as low as 2 per cent. The sugar content in general was so small that it was not deemed worth while to report it, as the beets were utterly worthless for seed production. The depressing influence of climate on the character of the beets is illustrated in a most striking manner by a comparison of the results obtained from beets grown in Kentucky and in Geneva, N. Y., from the same seeds, and under as nearly as possible identical conditions of culture.

INDIANA.

The unfortunate seasonal conditions which obtained at the experiment station at Lafayette have already been mentioned. The result of the prolonged drought during the growing season was a diminution of the weight of the beets to such an extent that for practical purposes they were useless. For this reason the data obtained are of little value. On account of the inferior character of the beets, no attempt was made to select any of them for mothers for the subsequent production of seed. The analytical data connected with the special plot work in Indiana are found in the tables following.

IOWA.

Only one set of samples was received from the plots grown in Iowa, the sample of the Demesmay having been harvested on the 25th of September and all the other samples on the 13th of November. The average size of the beets received was small, the percentage of sugar only fair, and the purity not up to the minimum standard. The seasonal influences at Ames were therefore evidently inferior in sugar-producing qualities to those which obtained in New York. The final harvest of beets was not forwarded to the Department for the purpose of selecting mothers by reason of a misunderstanding whereby the different varieties were mixed in such a way that the separation of them was impracticable. A general statement in regard to the special

plot work done at Ames is contained in the following letter from Director Curtiss:

AMES, IOWA, *January 25, 1898.*

DEAR SIR: Replying to your inquiry concerning the test of high-grade sugar-beet seed furnished by your Department, will say that we have forwarded you two samples of the Vilmorin's Elite from the plats grown according to your instructions, and have lately had your report of the last sample. The beets from these plats were analyzed by Dr. Weems, of our chemistry section, with the following results:

Variety.	Sugar.	Purity coefficient
	Per cent.	
Vilmorin's Élite	16.07	84.30
Demesmay	14.30	78.38
Improved Imperial Élite	13.31	76.14
Kleinwanzlebener	16.91	90.76

These samples and the one forwarded to you gave substantially the same results and were harvested November 11. The first sample sent you was taken earlier and was probably immature. The past season was quite backward here, and the beet crop correspondingly late in maturing. Owing to a change in our field-experiment department during the past year, the beets from these plats were, through a misunderstanding, thrown together instead of being kept separate after the analyses were made, and we will not be able to distinguish between varieties in testing these beets and carrying on future work along this line. We very much regret that this mistake has occurred, as we would like to continue the work of developing high-grade beets for seed production. We will be glad to cooperate with you again during the coming season if you can furnish us more seed.

Very truly, yours,

C. F. CURTISS.

Dr. H. W. WILEY,
Washington, D. C.

The analytical data derived from the analyses of beets sent from the Iowa station to this laboratory are of little value. Only one set of samples was received, namely, of the Demesmay variety, harvested on the 25th of September, and of the three varieties harvested on the 13th of November. With the exception of the Vilmorin Élite, which was received on the 22d of November, the analytical data are not satisfactory. In the case of the variety just mentioned the sugar content and the purity were satisfactory, but the beets were very much under size. It is evident that the data obtained in the past season do not fairly represent the capabilities of Iowa, either for the production of good commercial beets or for the growth of beets for seed-producing purposes. The analytical data obtained on analysis of the samples received at the Department are found in the table given farther on.

WISCONSIN.

Complete details of experiments with high-grade beet seeds, grown under the auspices of the Department of Agriculture, are found in the

Wisconsin report, contained in Bulletin No. 64 of that station. These details are so valuable as to warrant their reproduction in full:

EXPERIMENTS WITH HIGH-GRADE SUGAR-BEET SEED.

These experiments were, as already stated, conducted under the auspices of the United States Department of Agriculture. In a letter received in the early part of April last, the chief chemist of the Department, Dr. H. W. Wiley, requested this station to cooperate with the Department in growing a number of varieties of beets from high-grade seed furnished by them, giving the beets the best of conditions in respect to subsoiling, preparation of the seed bed, and cultivation. Some of the kinds of seed sent were produced by the highest possible scientific culture from specially analyzed beets, which were stated to average 19 per cent of sugar. According to the directions received, the Government plat was surrounded on all sides by our regular beet field and was located in the southeastern quarter of our main field. The different kinds of seed received and planted by hand on May 22 were as follows:

Plat A.—Dippe Brothers, Vilmorin Élite R I, from Dippe Brothers, Quedlinburg, Germany.

Plat B.—1. Original Kleinwanzlebener, grown by Kühn, Naarden, Holland. 2. Vilmorin Improved, grown at United States Sugar Beet Station at Schuyler, Nebr. 3. Demesmay sugar-beet seed, grown by F. Demesmay, Cysoing (Nord), France.

Plat C.—High-grade Commercial Kleinwanzlebener.

Plat D.—High-grade Commercial Vilmorin's Improved "La Plus Riche."

White Improved Imperial Élite, grown by Martin Grashoff, Quedlinburg, Germany.

Dippe Brothers, Kleinwanzlebener Élite W I, from Dippe Bros., Quedlinburg, Germany.

The plats were arranged, as suggested by Dr. Wiley, in the following manner: Plats A and B, each 21 by 24 feet, were placed in the middle and were surrounded by a border, CC, 67 feet long and 9½ feet wide; the plats D^1 and D^2 were placed at the east and west ends of the C plat, being 21 by 40 feet. South and north of the whole plat three rows were run 110 feet long, in which were planted the varieties given in the preceding statement, White Imperial being planted in the south three rows, and Kleinwanzlebener Élite in the north three rows. The rows were 18 inches apart. The effort was to have one good vigorous beet plant at about every 9 inches in the row after thinning.

The germinations of the seed planted in this experiment, as well as of that planted in our other trials, were determined by Professor Goff, and are given on pages 300–301 of our Fourteenth Annual Report. It will be seen that the germinative power of the different kinds of seed was very good, with the possible exception of the Schuyler, Nebr., seed, which was old, and the Dippe Brothers' Vilmorin Élite seed. The average germination of the seed was 167 per cent, ranging from 115 to 231 per cent, the latter result being obtained with the White Improved Imperial Élite.

The first samples of the beets raised on the Government plat were taken September 20; another sample was taken September 27, and after that time every fourteen days until the beets were harvested, on November 5. In sampling the beets four beets were dug of each kind. Two of these were forwarded to Washington, D. C., to the Department of Agriculture, and the other two retained for analysis in our own laboratory.

The results of the analyses made by the writer are given in the following table. The C^1 samples were taken south of the A and B plats and the C^2 samples north of these plats. In the same manner the D^1 and D^2 samples were taken from the plats east and west, respectively, of the central plats.

Main field, Government plat.

Variety.	Date of sampling.	Per cent root of whole plant.	Weight of beets.	Analysis of juice.		
				Specific gravity.	Sugar.	Purity coefficient
			Pounds.		*Per cent.*	
Imperial Elite	Sept. 20	70	0.21	1.0755	14.44	79.1
	Sept. 27	70	.40	1.0934	17.92	80.5
	Oct. 11	78	.40	1.0834	17.04	85.0
	Oct. 25	80	.58	1.0858	16.35	79.4
	Nov. 5	....	.83	1.0740	14.35	80.1
Average	....	....	.48	....	16.02	80.8
Vilmorin La Plus Riche, D_1	Sept. 20	73	.34	1.0882	16.96	80.4
	Sept. 27	73	.80	1.0923	17.58	79.9
	Oct. 11	72	.98	1.0895	17.93	83.8
	Oct. 25	82	.95	1.0860	16.40	79.5
	Nov. 5	....	1.20	1.0882	16.53	78.3
Average	....	....	.85	....	17.08	80.4
High-grade Kleinwanzlebener, C_1	Sept. 20	73	.37	1.0825	16.45	83.0
	Sept. 27	70	.55	1.0898	17.21	80.0
	Oct. 11	59	.50	1.0870	16.15	77.5
	Oct. 25	78	.50	1.0810	14.35	73.6
	Nov. 5	....	1.13	1.0845	16.90	83.5
Average	....	....	.61	....	16.21	79.5
Vilmorin Improved, Nebr., B	Sept. 20	70	.75	1.0725	15.06	85.7
	Sept. 27	76	.45	1.0810	16.70	85.7
	Oct. 11	80	1.13	1.0848	17.01	83.6
	Oct. 25	91	.75	1.0857	15.86	77.2
	Nov. 5	....	.71	1.0800	15.71	81.5
Average	....	....	.76	....	16.07	82.7
Original Kleinwanzlebener, Holland, B	Sept. 20	68	.45	1.0860	16.63	80.7
	Sept. 27	67	.20	1.0946	18.57	82.4
	Oct. 11	73	.40	1.0935	17.95	80.6
	Oct. 25	73	.30	1.0980	17.34	74.5
	Nov. 5	....	.35	1.0920	18.65	81.8
Average	....	....	.37	....	17.83	80.0
Dippe's Kleinwanzlebener	Sept. 20	64	.70	1.0695	14.57	86.3
	Sept 27	68	.90	1.0836	17.11	85.2
	Oct. 11	71	.93	1.0917	18.17	83.0
	Oct. 25	71	.50	1.1070	21.45	85.2
	Nov. 5	....	.95	1.0812	16.42	84.0
Average	....	....	.80	....	17.54	84.7
Vilmorin's La Plus Riche, D_2	Sept. 20	67	1.03	1.0735	16.13	90.6
	Sept. 27	72	1.15	1.0800	16.90	83.0
	Oct. 11	73	1.23	1.0868	17.56	84.4
	Oct. 25	78	1.35	1.0917	18.88	86.3
	Nov. 5	....	....	....	....	....
Average	....	....	1.19	....	17.37	86.1
High-grade Kleinwanzlebener, C_2	Sept. 20	72	1.05	1.0850	17.94	87.9
	Sept. 27	65	.70	1.0842	16.70	82.6
	Oct. 11	75	.70	1.0885	17.57	83.0
	Oct. 25	82	1.30	1.0940	19.18	85.7
	Nov. 5	....	....	....	....	....
Average	....	....	.94	....	17.85	84.8
Demesmay Improved, B	Sept. 20	76	.80	1.0655	13.23	82.8
	Sept. 27	81	.93	1.0695	13.49	79.8
	Oct. 11	78	1.10	1.0678	12.85	77.9
	Oct. 25	89	.85	1.0798	15.95	83.0
	Nov. 5	....	.93	1.0690	13.66	81.4
Average	....	....	.92	....	13.84	81.0
Dippe Vilmorin, A	Sept. 20	63	.62	1.0790	16.05	84.3
	Sept. 27	73	1.00	1.0852	16.86	82.5
	Oct. 11	73	1.10	1.0895	17.49	81.7
	Oct. 25	82	1.03	1.0920	18.34	83.6
	Nov. 5	....	.75	1.0827	16.91	85.1
Average	....	....	.90	....	17.13	83.4

We notice that the per cent of sugar in the juice but rarely came over 18 in case of the different varieties, the average figures ranging from 13.84 per cent (Demesmay) to 17.85 per cent (High-grade Commercial Kleinwanzlebener, C_2); the purity of the beet juice was good, viz, lowest 79.5 (High-grade Commercial Kleinwanzlebener, C_1), highest 86.1 (Vilmorin La Plus Riche, D_2).

The average results of the analyses of these beets obtained by the Department of Agriculture and in this laboratory are given below:

Determinations made by—	Number of analyses.	Polariscope method.	Alc. extraction method.	Purity coefficient.
United States Department of Agriculture	38 (31*)	16.27	....	84.7
Wisconsin Experiment Station	38 (31*)	16.09	15.13	82.0

* Number of determinations of purity of juice.

While the agreement is as good as could be expected between the results obtained by the polariscope method, the purity coefficient differs rather more than allowable in duplicate samples. The two sets of analyses differ in this way, that the Department of Agriculture samples were always analyzed at least several days after our analyses were made, since the latter were always finished within twenty-four hours from the time of sampling. In single instances, variations occurred between the Department of Agriculture and our analyses of 3 per cent of sugar in the juice and of over 7 per cent purity, owing to differences in the stage of maturity of the beets analyzed; it is evident that no absolutely correct idea of the sugar content of the beets in a certain plat or field can be obtained by pulling and analyzing two single beet roots, even if these do appear to be at about average stage of maturity.

The yield of beets from the plat, obtained at harvesting, November 5, and the calculated yield of beets and of sugar per acre, are shown in the following table:

Yield of beets and of sugar, Government plat.

Name of variety.	Yield of beets.		Average weight of beets.	Sugar in the beet.	Sugar per acre.
	From plat.	Per acre.			
	Pounds.	*Pounds.*	*Pounds.*	*Per cent.*	*Pounds.*
Imperial Elite	272.3	24,210	0.45	13.63	3,300
Vilmorin La Plus Riche	1,167.3	28,290	.64	15.70	4,441
High-grade Commercial Kleinwanzlebener	1,170.0	30,660	.56	16.05	4,920
Dippe Brothers Kleinwanzlebener Elite	311.7	34,380	.66	15.60	4,995
Dippe Brothers Vilmorin Elite	336.6	29,090	.58	16.06	4,672
Demesmay	234.4	31,520	.61	12.98	4,092
Vilmorin, Schuyler, Nebr	76.7	30,940	.59	14.92	4,616
Original Kleinwanzlebener, Holland	26.0	15,730	.27	17.72	2,788
Averages, etc	3,595.0	28,103	....	15.04	4,228

The average yield of beets per acre obtained was over 14 tons, or about 5 tons more than the yield obtained from either half of the main field. The average calculated yield of sugar per acre was 4,228 pounds, the lowest yield being obtained in case of Original Kleinwanzlebener, Holland (2,788 pounds), which variety plainly suffered most from the drought, and the highest in case of Dippe's Kleinwanzlebener Elite (4,995 pounds).

ANALYSES MADE AT THE LABORATORY OF THE DEPARTMENT OF AGRICULTURE.

Samples of beets from the high-grade plots were sent from time to time to the laboratory of the Department of Agriculture for analysis, and finally all the remaining beets of proper size were forwarded for

examination. The following table contains the analyses of the samples received from the various stations of the three separate harvests of beets, ranging from the last of September to the last of October, together with the analyses of all the samples of the high-grade beets harvested in the middle of November:

Table showing analyses of beets of high grade from experiment stations of Tennessee, Kentucky, Indiana, Iowa, Wisconsin, and New York.

KNOX COUNTY, TENN.

[Experiment Station, Knoxville.]

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.		*Ounces.*	*Per ct.*	
200	White Improved Imperial Elite	May 24	Sept. 25	Sept. 27	2	4	11.5	....
201	Kleinwanzlebener Elite	....do	....do	....do	2	7	10.7	....
203	Original Kleinwanzlebener (Dippe Brothers)	May 18	....do	....do	2	3	12.5	....
204	Original Kleinwanzlebener (Holland)	....do	....do	....do	4	1	12.5	....
206	High grade Kleinwanzlebener	....do	....do	....do	2	6	12.0	....
202	Vilmorin's "La Plus Riche"	....do	....do	....do	2	7	10.6	....
205	Vilmorin's Improved	....do	....do	....do	5	1	13.2	....
207	Demesmay	....do	....do	....do	3	1	13.5	....

FAYETTE COUNTY, KY.

[Experiment Station, Lexington.]

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.				
285	Original Kleinwanzlebener (Holland)	....	Sept. 27	Sept. 29	....	21	13.3	72.5
834–870	.....do	....	Oct. 14	Oct. 18	37	7	15.8	....
286	Vilmorin's Improved (Schuyler, Nebr.)	....	Sept. 27	Sept. 29	....	19	10.9	68.5
287	Demesmay	....	....do	....do	....	18	9.5	65.0
293	White Improved Imperial Elite	....	....do	....do	....	17	10.9	68.1
785–832	.....do	....	Oct. 14	....	48	7	11.1	....

TIPPECANOE COUNTY, IND.

[Experiment Station, Lafayette.]

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.				
169	Original Kleinwanzlebener (Holland)	May 5	Sept. 24	Sept. 27	2	4	16.5	....
436	.....do	....do	Oct. 8	Oct. 10	2	5	14.3	....
2203	.....do	....do	Nov. 22	Nov. 24	5	6	19.1	84.4
171	Kleinwanzlebener Elite (Dippe Brothers)	May 19	Sept. 24	Sept. 26	2	3	14.4	....
448	.....do	....do	Oct. 8	Oct. 10	2	4	14.7	....
2202	.....do	....do	Nov. 22	Nov. 24	6	9	18.5	83.6
172	Demesmay	May 5	Sept. 24	Sept. 26	2	5	12.6	....
449	.....do	....do	Oct. 8	Oct. 10	2	8	12.5	....
2204	.....do	....do	Nov. 22	Nov. 24	14	9	14.3	80.6
178	Vilmorin's Improved Elite (Dippe Brothers)	May 19	Sept. 24	Sept. 26	2	4	13.9	....
447	.....do	....do	Oct. 8	Oct. 10	2	4	14.6	....
2206	.....do	....do	Nov. 22	Nov. 24	5	7	16.5	80.1
180	Vilmorin's Improved (Schuyler, Nebr.)	May 5	Sept. 24	Sept. 26	2	6	14.5	....
2205	.....do	....do	Nov. 22	Nov. 24	10	7	15.4	81.3
430	Vilmorin's Improved	....do	Oct. 8	Oct. 10	2	6	16.1	....

Table showing analyses of beets of high grade from experiment stations of Tennessee, Kentucky, Indiana, Iowa, Wisconsin, and New York—Continued.

STORY COUNTY, IOWA.

[Experiment Station, Ames.]

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.		*Ounces.*	*Per ct.*	
249	Demesmay	May 29	Sept. 25	Sept. 28	3	11	13.9	....
2078	White Improved Imperial Elite	....do	Nov. 13	Nov. 22	2	13	16.7	79.1
2088	Vilmorin's Improved	....do	....do	....do	2	19	13.0	72.5
2099	Vilmorin's Elite	....do	....do	....do	2	12	17.3	82.6
2100	Original Kleinwanzlebener	....do	....do	....do	2	20	12.8	72.4

DANE COUNTY, WIS.

[Experiment Station, Madison.]

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.				
217	Dippe's Kleinwanzlebener	May 22	....	Sept. 29	2	10	15.0	80.5
882	....do	....do	....	Oct. 12	2	11	18.5	87.3
1465	....do	....do	....	Oct. 27	2	9	19.5	....
1912	....do	....do	Nov. 3	Nov. 17	12	16	15.3	83.1
	Averages*	....	....	....	....	14	15.9	83.3
222	Original Kleinwanzlebener (Holland)	May 22	....	Sept. 29	2	5	15.4	....
881	....do	....do	....	Oct. 12	2	8	18.9	87.2
1469	....do	....do	....	Oct. 27	2	7	18.9	....
1913	....do	....do	Nov. 2	Nov. 17	11	6	18.7	80.7
	Averages*	....	....	....	....	6	18.4	82.0
225	Kleinwanzlebener	May 22	....	Sept. 29	2	13	14.6	85.0
877	....do	....do	....	Oct. 12	2	9	16.3	82.2
1468	....do	....do	....	Oct. 27	2	13	17.3	84.1
226	....do	....do	....	Sept. 29	2	9	13.8	86.3
878	....do	....do	....	Oct. 12	2	6	15.5	86.2
1464	....do	....do	....	Oct. 27	2	6	18.5	....
1918	....do	....do	Nov. 3	Nov. 17	188	15	17.3	85.1
	Averages*				....	14.7	17.2	85.1
218	White Improved Imperial Elite	May 22	....	Sept. 29	2	9	14.0	86.0
876	....do	....do	....	Oct. 12	2	8	17.1	....
1463	....do	....do	....	Oct. 27	2	5	18.3	....
1911	....do	....do	Nov. 3	Nov. 17	12	15	15.4	83.2
	Averages*				....	12.4	15.5	83.5
219	Dippe's Vilmorin Elite	May 22	....	Sept. 29	2	14	14.3	84.3
880	....do	....do	....	Oct. 12	2	10	18.3	87.2
1466	....do	....do	....	Oct. 27	2	16	18.5	86.9
1917	....do	....do	Nov. 2	Nov. 17	115	14	17.7	86.7
	Averages*	....	....	....	....	14.0	17.7	86.7
221	Vilmorin's Improved Schuyler, seed	May 22	....	Sept. 29	2	16	13.6	82.6
879	....do	....do	....	Oct. 12	2	15	16.8	85.0
1461	....do	....do	....	Oct. 27	2	12	16.2	82.1
1916	....do	....do	Nov. 2	Nov. 17	24	12	15.6	82.5
	Averages*	....	....	....	....	12.4	15.6	82.7

* In figuring the averages, each analysis is valued in proportion to the weight of the sample.

Table showing analyses of beets of high grade from experiment stations of Tennessee, Kentucky, Indiana, Iowa, Wisconsin, and New York—Continued.

DANE COUNTY, WIS.—Continued.

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.		*Ounces.*	*Per ct.*	
223	Vilmorin's "La Plus Riche"	May 22		Sept. 29	2	18	14.9	83.4
871	do	do		Oct. 12	2	16	17.9	88.2
1462	do	do		Oct. 27	2	12	17.6	85.2
224	do	do		Sept. 29	2	13	14.3	86.2
875	do	do		Oct. 12	2	8	19.2	
1467	do	do		Oct. 27	2	10	19.0	85.4
1915	do	do	Nov. 3	Nov. 17	236	15	17.7	86.7
	Averages †					15	17.7	86.8
220	Demesmay	May 22		Sept. 29	2	12	13.4	84.8
1470	do	do		Oct. 12	2	12	15.0	83.5
1914	do	do	Nov. 2	Nov. 17	91	13	13.6	81.0
	Averages †					13	13.6	81.1

ONTARIO COUNTY, N. Y.

[Experiment station, Geneva.]

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.				
227	White Improved Imperial Elite	May 19	Sept. 27	Sept. 28	4	14	12.6	80.6
1409	do	do	Oct. 14	Oct. 15	4	16	14.8	82.0
	do	do	Oct. 29 / Oct. 30		174	18	15.3	(*)
	Averages †					18	15.2	81.3
228	Vilmorin's "La Plus Riche"	May 19	Sept. 27	Sept. 28	4	20	15.1	85.5
231	do	do	do	do	4	17	15.6	87.2
1403	do	do	Oct. 14	Oct. 15	4	16	16.8	84.2
1410	do	do	do	do	4	16	16.6	85.7
	do	do	Oct. 29 / Oct. 30		207	20	18.3	(*)
	Averages †					20	18.1	85.6
229	Vilmorin's Improved (Schuyler, Nebr.)	May 15	Sept. 27	Sept. 28	5	20	14.2	84.2
1406	do	do	Oct. 14	Oct. 15	4	16	15.2	87.8
	do	do	Oct. 29 / Oct. 30		32	18	15.7	(*)
	Averages †					18	15.5	85.6
234	Vilmorin's Improved	May 19	Sept. 27	Sept. 28	4	15	13.6	82.2
1404	do	do	Oct. 14	Oct. 15	4	15	14.6	81.4
	Averages †					15	14.1	81.8
230	Demesmay	May 19	Sept. 27	Sept. 28	4	18	13.3	82.8
1401	do	do	Oct. 14	Oct. 15	4	16	12.3	79.2
	do	do	Oct. 29 / Oct. 30		107	18	15.9	(*)
	Averages †					18	15.7	81.1
232	Vilmorin's Improved Elite (Dippe Brothers)	May 19	Sept. 27	Sept. 28	4	19	15.2	86.0
1407	do	do	Oct. 14	Oct. 15	4	16	16.7	84.9
	do	do	Oct. 29 / Oct. 30		64	19	18.1	(*)
	Averages †					19	17.9	85.5

* Not included in averaging the purity coefficients.

† In figuring the averages, each analysis is valued in proportion to the weight of the sample it represents.

Table showing analyses of beets of high grade from experiment stations of Tennessee, Kentucky, Indiana, Iowa, Wisconsin, and New York—Continued.

ONTARIO COUNTY, N. Y.—Continued.

Serial No.	Variety.	Time of planting.	Time of harvesting.	Date received.	Number of beets.	Average weight.	Sugar in the beets.	Purity coefficient.
		1897.	1897.	1897.		*Ounces.*	*Per ct.*	
233	High-grade Commercial Kleinwanzlebener	May 19	Sept. 27	Sept. 28	4	20	15.1	86.4
1402	.....do	....do	Oct. 14	Oct. 15	4	15	15.2	83.2
	.....do	....do	Oct. 29 / Oct. 30	....	224	18	17.8	(*)
	Averages †					18	17.7	85.0
235	Original Kleinwanzlebener (Holland)	May 19	Sept. 27	Sept. 28	4	18	16.2	86.7
1405	.....do	....do	Oct. 14	Oct. 15	4	13	16.4	84.7
	.....do	....do			7	18	19.2	(*)
	Averages †					17	17.7	85.8
1408	Kleinwanzlebener Elite (Dippe Brothers)	May 19	Oct. 14	Oct. 15	4	16	17.3	84.6
	.....do	....do	Oct. 29 / Oct. 30	....	211	20	18.7	....
	Averages					20	18.7	....

* Not included in averaging the purity coefficients.
† In figuring the averages, each analysis is valued in proportion to the weight of the sample it represents.

Discussion of above data.—No further discussion of the analytical data contained in the above table is necessary, except in the case of the samples received from Wisconsin and New York. These samples were exceptionally fine. By an unfortunate misunderstanding all the beets received from Wisconsin were reduced to pulp for the purpose of getting an average sample for analysis. The selection for mother beets was, therefore, confined to the samples from New York.

WISCONSIN.

Almost uniformly good results were obtained in these experiments. The Original Kleinwanzlebener (Holland) seed produced beets, however, too small for all practical purposes, although the sugar content and purity were high. The largest beets and those of the highest purity were produced by the Vilmorin La Plus Riche seed. The Demesmay seed which were used were only the commercial article, and were not grown from specially analyzed mothers. It is not surprising, therefore, to see that they produced a crop which was the poorest of all in sugar content.

The particular analyses of the most importance are those which were made on the beets received November 17, and harvested on the 3d of November. These practically represent the beets at their full maturity, as it is not probable that they would improve in quality in the climate of Madison after the 1st of November. The analyses also represent the greatest number of beets, and therefore are the most reliable. The largest number of beets of proper size and shape were produced by the Vilmorin La Plus Riche seed, and the

smallest by the Original Kleinwanzlebener. The beets grown from the Schuyler seed are of particular interest because they represent the link of union between the experiments which were discontinued by the Department in 1893 and reinaugurated in 1897. The average size of the beets produced by the Schuyler seed is somewhat small, but the content of sugar and the purity are satisfactory. Upon the whole, the effect of high-grade seed and high culture are most distinctly marked. It is only necessary to compare the results obtained in the experiments with these high-grade seeds with those secured in the State at large to show the possibilities of beet production in Wisconsin. With such data before the investigator, it is evident that he must be convinced of the fact that it is possible, with proper conditions of seed and culture, to produce a grade of beets of the highest quality in Wisconsin.

New York.

Most satisfactory results were obtained from the experimental work in the State of New York at Geneva. Two sets of samples were received from the station, representing intervals of about two weeks in harvesting, the first set of samples having been harvested on the 27th of September and the second on the 14th of October. It will be noticed that a marked improvement was secured by postponing the harvest for two weeks, showing that as a rule it is not to be expected that the season for manufacturing in New York should begin before the middle of October. The above table includes also the final harvest, which was made much later in the season, viz, October 29–30, and shows even a greater improvement. The beets from the final harvest were all sent to Washington, and were carefully selected for seed production. The data obtained in this selection are given as the third in the series of analyses. The samples which were grown at the New York station were from seeds of two different qualities: First, commercial seeds, as represented by the Demesmay White Imperial and high-grade commercial Kleinwanzlebener; and, second, seeds grown directly from high-grade mothers, represented by the Vilmorin La Plus Riche, the Vilmorin Improved (Schuyler), and the Original Kleinwanzlebener. The average size of the beets selected for analysis was not quite 20 ounces; the sugar content in most cases was high, and the purity extremely satisfactory. After leaving the beets unharvested until the end of October they were found to have increased their content of sugar very markedly, as will be shown in the table of analyses for the selection of mothers. The encouraging data obtained at the New York station suggests that if the Department should reestablish its experiment stations for the production of high-grade seeds one of them should be placed in this locality.

In the analysis of the beets to be selected as mothers for producing seeds no attempt was made to determine the coefficient of purity, as the amount of pulp removed was only sufficient to determine the

percentage of sugar directly therein. It is evident, however, that the purity coefficients of all the different varieties would not have been diminished by perfect maturity, so that they may be regarded as fully equal to the average in each case. In fact, it would be fair to assume that the averages of the final harvest of the most mature beets were slightly above those taken for the average of the three analytical periods of the season. In the discussion of the data obtained by the analysis it must be remembered that the averages in all cases are made upon the total weight of the material entering into the analysis. Not only is this true of each individual sample, but also of the average analyses of the samples. It is evident that this is the one exact method of obtaining average results, and it is only the averages obtained by such a method that have a convincing value.

DATA OF EACH VARIETY.

The White Improved Imperial Élite, grown from commercial seeds gave beets of fair commercial quality. An average weight of 18 ounces, with a content of 15.2 per cent of sugar in the beets and a coefficient of purity of 81.3, would insure a large yield in a well-built and well-operated factory. From the complete harvest, 174 beets were found of the required size, shape, and sugar content to warrant saving for the production of seed. It is evident, however, that this seed would be only of a medium grade commercial quality, and not suited to the improvement of the beet.

Vilmorin La Plus Riche.—This plot gave excellent results throughout. The average size of the beets was the largest of any of the plots grown. The purity coefficients were exceptionally high, and the sugar contents most satisfactory. Two hundred and seven beets grown on this plot, having an average weight of 20 ounces and a mean content of sugar of 18.3 per cent, were selected for seed production. It is evident that the coefficient of purity of this selection must have been at least 86. These mothers will therefore produce seeds of the highest quality, which can subsequently be planted, growing beets for the production of seeds of exceptional properties.

Vilmorin Improved, Schuyler Seed.—This variety is chiefly of interest now because it represents the continuation of the work in seed production which was discontinued four years ago. The seeds evidently have lost in vitality by their long keeping, and the product, therefore, is not as satisfactory as could have been desired. The average sugar content is not exceptionally high, but the purity is excellent. The beets produced from these seeds in another year will doubtless develop some exceptionally high-grade mothers, and thus the strain will be continued. This plot represents the sole surviving result of the three years' experiments at Schuyler, commenced in 1890. Thirty-two beets, with an average weight of 18 ounces and an average content of sugar of 15.7 per cent were put aside for seed production. It is seen, from an

inspection of the table, that the coefficient of purity of this lot was 87 or more. It therefore represents the highest grade of purity of any of the lots.

Vilmorin Improved.—This is a commercial seed, used for planting around the central plots, and has produced a crop of only fair commercial value.

Demesmay.—This is also a commercial seed, obtained directly from the growers in the north of France, and, as will be seen from an inspection of the table, produced a crop of excellent commercial value.

Vilmorin Improved Élite, grown by Dippe Brothers.—This seed represents the improvement in the strain of the Vilmorin beet when cultivated according to the highest scientific principles in Germany. Sixty four beets grown on this plot, having an average weight of 19 ounces, were selected for mothers. The mean content of sugar in these beets was 18.1. It is evident, also, that the purity was at least 86 per cent. This harvest, therefore, represents a very high grade quality of mothers for continuing the improvement.

High-grade Commercial Kleinwanzlebener.—This variety of seed represents the highest grade of commercial seeds offered to the market. The results of culture show that the tendency of this seed to produce rich beets is extremely well marked. Two hundred and twenty-four beets grown on this plot, with an average weight of 18 ounces, were selected as mothers. The mean content of sugar in these beets was 17.8 per cent, and the purity, as seen by the table, is evidently high. These high-grade commercial seeds, therefore, produce a strain of beets almost as valuable for sugar production as the specially high grade seeds from analyzed mothers.

Original Kleinwanzlebener (Holland.)—This variety of seed represents the Kleinwanzlebener type as cultivated to the highest degree in Holland. The tendency in that country seems to be to the production of a beet of small size and exceptionally high sugar content. Only a few of these high-grade seeds were planted, and this, together with their small size, accounts for the fact that only seven were selected. The mean weight of the seven was 18 ounces, the mean content of sugar therein 19.2, and the coefficient of purity evidently 86 or over. This variety produced the highest content of sugar of any cultivated, but on account of the small size is less to be recommended for general cultivation in this country than some of the other varieties.

Kleinwanzlebener Elite.—This variety represents the specially-selected seeds grown by Dippe Brothers, at Quedlinburg. The beets grow to a fine size, are of good shape, and have excellent qualities to recommend them to the manufacturer. Two hundred and eleven of these beets, having an average weight of 20 ounces, were selected as mothers. The mean content of sugar in these beets was 18.7 per cent, and the coefficient of purity, as will be seen by the table, good.

CLASSIFICATION OF THE BEETS OF EACH VARIETY.

It will be interesting to study the distribution of the beets of each variety according to sugar content. This can be done by means of the following table:

Variety.	Number of beets having contents of sugar from—				Maximum polarizations of individual beets.	Minimum polarizations of individual beets.
	15 to 16 per cent.	16 to 17 per cent.	17 to 18 per cent.	18 per cent and above.	Per cent.	Per cent.
White Improved Imperial Élite	65	20	23	4	19.6	11.6
Vilmorin La Plus Riche	7	16	32	94	23.4	13.4
Vilmorin Improved, Schuyler Seed	4	8	5	3	18.8	12.4
Demesmay	11	14	5	40	22.0	9.6
Vilmorin Improved Élite (Dippe Brothers)	1	4	5	47	21.6	10.6
High Grade Commercial Kleinwanzlebener	19	30	64	107	22.0	13.6
Kleinwanzlebener (Holland)	0	1	9	50	22.2	18.4
Kleinwanzlebener Élite	6	15	24	165	22.0	14.6

PRESERVATION OF THE MOTHER BEETS.

The spaces in the beets caused by the removal of the diagonal core for analysis were filled with cotton saturated with formaldehyd. The beets thus prepared were placed in silos, where they will remain until March.

GROWTH OF SEED FROM THE MOTHERS ABOVE DESCRIBED.

Since the pollen of the beet is easily transported, it is necessary that each variety of seed be grown in plots entirely removed from any danger of fertilization from other localities. In order to secure this, one of the varieties preserved will be planted, through the courtesy of Mr. William Saunders, superintendent of the garden and grounds, in the Department garden at Washington and arrangements have been made with the following experiment stations to grow one variety each of the remaining beets, viz: Maryland; Ithaca and Geneva, N. Y.; Michigan, Wisconsin, and Iowa. As soon as practicable in the spring the silos will be opened and the beets forwarded to the stations above named for transplanting.

The beets of each variety of different degrees of strength should be planted as far removed as possible from the other classes. For instance, the beets in the grade of 20 per cent of sugar should be planted far enough from other grades of the same variety to prevent intermixing of the pollen. In this way the strain of excellence can be best preserved. The beets which have been saved for mothers are to be divided into classes representing different degrees of saccharine strength, and each of these classes planted separately to produce high grade seed for future use.

NECESSITY OF SEED DEVELOPMENT.

It is highly important for the rapid and safe progress of the beet-sugar industry in this country that attention should be paid to the production of high-grade seeds. We have in the United States such great differences in soils and climatic conditions as to render it evident that

a single station for the production of seeds would not be sufficient. Beets of different qualities should be developed in different localities. The character of beets best suited to the fields of New York and Wisconsin, for instance, would not be the ideal plant for the semiarid regions of Nebraska. On the other hand, it is evident that beets grown in an arid region, as, for instance, Chino and other valleys of California, without irrigation and with scarcely any rainfall, should have a longer tap root than those grown in localities where rainfall is abundant or irrigation is practiced. It seems plain, therefore, that three, if not four, stations should be established, and in order that this work may be conducted under uniform methods these stations should be established and maintained by the Department of Agriculture.

One of these stations should be located in an area of average rainfall and ordinary meteorological conditions as presented, for instance, by the States of New York and Michigan.

The second station should be established in a locality where a deficient rainfall is to be expected, and where the vicissitudes attending meteorological changes are the greatest, as, for instance, in South Dakota or Nebraska.

The third station should be established in a region where irrigation is practiced, as, for instance, in Colorado, New Mexico, or Utah.

A fourth station should be devoted to the development of a beet best suited to arid regions where irrigation is not practiced, as, for instance, in the coast valleys of California.

It is only by a careful, systematic, and scientific development of beets suited to these different localities that we can expect to promote in the most favorable manner the development of the beet sugar industry in the United States. It is evident that the continuation of the experiments which have been conducted by the Department of Agriculture for so many years in the analysis of beets and in the delimitation of areas suited to beet culture should now be supplemented by a more rigid scientific attempt to develop beets of characteristics best suited to the four typical localities which have been specified above. The maintenance of a small experiment station entirely competent to accomplish this work in each of the localities mentioned would not require a very great outlay of money and would result in the greatest possible good to the industry.

STATISTICS OF AMERICAN BEET-SUGAR PRODUCTION.

The information contained in the following table has been obtained through the courtesy of the beet-sugar factories:

Statistics of the production of beet sugar in the United States for the year 1897.

Number of factories in operation	9
Number of acres of beets harvested	41,272
Approximate average price paid for beets	\$4.10
Approximate average per cent of sugar in the beets	14.49
Total pounds of granulated sugar made	90,060,470
Total pounds of raw sugar made	431,200
Granulated sugar obtained per cent beets	11.56
Raw sugar obtained per cent beets	0.06
Total sugar obtained per ton (2,000 pounds) of beets ... pounds	232.4

Statistics of individual factories for the year 1897.

Name of factory and location.	Beets harvested.	Beets harvested.	Price paid per ton of beets.	Time the machinery was in operation.	Sugar content of the beets.	Total output of granulated sugar.
	Acres.	*Tons.*		*Days.*	*Per ct.*	*Pounds.*
Alameda Sugar Co., Alvarado, Cal	4,808	48,773	$4.00	90	14.20	10,198,648
Chino Valley Beet Sugar Co., Chino, Cal	9,678	97,197	(*a*)	151	15.10	24,303,122
First New York Beet Sugar Co., Rome, N. Y	700	4,325	5.00	45	(*b*)	*c*765,700
Oxnard Beet Sugar Co., Grand Island, Nebr	4,282	38,607	(*d*)	(*d*)	12.90	6,798,200
Los Alamitos Sugar Co., Los Alamitos, Cal	2,800	29,542	4.16	105	15.73	6,017,900
Norfolk Beet Sugar Co., Norfolk, Nebr	4,029	36,113	(*d*)	(*d*)	13.60	7,941,400
Pecos Valley Beet Sugar Co., Eddy, N. Mex	1,600	5,700	4.00	38	14.00	1,020,000
Utah Beet Sugar Co., Lehi, Utah	3,000	18,500	4.25	56	13.20	3,670,600
Western Beet Sugar Co., Watsonville, Cal	10,375	110,878	4.00	104	15.00	29,776,000
Total	41,272	389,635				90,491,670

a $3.50 per ton for 12 per cent beets, and 25 cents per ton for each per cent above 12. The Chino factory employed a saccharate process.
b Red beets, 5½ to 12 per cent sugar; white beets, 13 to 17 per cent sugar. Average analysis not reported.
c 431,200 pounds raw sugar are included.
d Not reported.

REMARKS ON THE BEET-SUGAR STATISTICS FOR 1897.

The past season was not very favorable to the production of beets in several localities in California and in New Mexico and Utah. Insufficient rain in California at the time of planting resulted in a smaller acreage being planted to beets and in a small yield of roots per acre. The great shortage in the crop reduced the quantity of sugar produced in California below that of the previous year, notwithstanding the fact that the new factory at Los Alamitos was operated and that at Chino increased its output.

The first New York beet-sugar factory was somewhat unfortunate in the varieties of beets selected. The red beets contained very little sugar, and undoubtedly decreased the output below what it should have been under favorable conditions. The white beets were of satisfactory sugar content. As may be noted by an examination of this report of the experiments made in the State of New York during the past season, that State is capable of producing beets of very great richness.

The shortage in the output of sugar is to some extent due to a decreased acreage at Lehi, Utah, and at Watsonville, Cal., these two factories having a larger crop in 1896 than they could work to advantage. In 1896 the factory at Watsonville produced nearly 20,000 short tons of sugar from approximately 150,000 tons of beets, and the past year 14,888 short tons from 110,878 tons of beets. The total production for the country shows an increase of approximately 5,000 tons in 1897 over that of 1896. The increase in the output of sugar next season, should more favorable conditions prevail in California, will be very large, since eight new factories, having a daily capacity of approximately 6,700 tons of beets, will be in operation.

The output is reported in the tables in pounds of granulated sugar, since but one factory marketed raw sugar. The quantity of raw sugar produced does not materially modify the statistics of the production.

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